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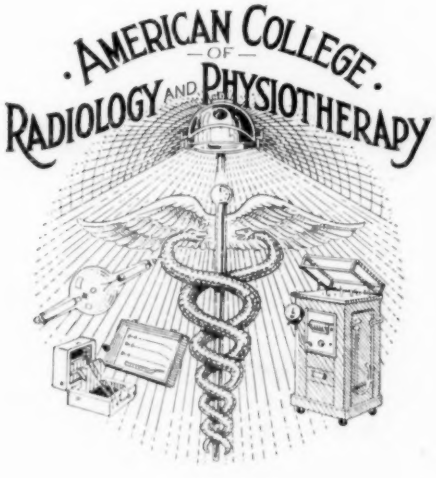

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Principles Underlying Removal of Pathology at Apices of Teeth*

WILLIAM L. SHEARER, D. D. S., M. D., F. A. C. S.
ALBERT F. TYLER, B. Sc., M. D., F. A. C. P.
Omaha.

TWO epoch making advances in medicine have brought about a much better understanding of oral pathology. The one is the contribution of Dr. Frank Billings and his coworkers, and proves the intimate connection between certain systemic diseases and foci of infection, the other, inspired by this, is a better knowledge of oral pathology. The latter advance is due to the work of Dr. W. S. Price, of Cleveland, Dr. Burt Thoma, Dr. T. B. Hartzel, Dr. Kathleen Dewey and others, coupled with the introduction of oral roentgenograms and their proper interpretation. Today there is no more valuable diagnostic aid in oral surgery than the roentgenogram. Proper interpretation must be added to proper photographic technique in order to arrive at proper conclusions. Proper interpretation is possible only by visualized knowledge of pathological processes in the mouth coupled with a knowledge of how these processes manifest themselves on the roentgenogram. Every day brings out some new value to shadows seen on the film.

Certain fundamental principles may properly be reviewed. Due to the contour of the teeth and jaws it is impossible to make roentgenograms in two planes as is done in examining the bones of the extremities. One may add value to the problem in hand by taking films at different angles but even then one cannot fully realize the actual extent of the lesion shown in the films. Occasionally one may overlook a disease area which is overshadowed by the more dense image of the tooth itself. This error occurs when the lesion is lateral, buccal, lingual or distal to the tooth.

Experience has shown that the area of disease is always larger than the area shown on the roentgenogram. This is explained by the fact that absorption of the lime salts has not progressed enough at the margin of the lesion to be clearly visualized on the roentgenogram. It is important to remember that when the diseased process about the apex of a tooth is demonstrable on the roentgenogram that the disease has already involved the bone of the alveolar process to a considerable extent. In fact the disease is more extensive in the bone than in the tooth itself. How important this fact is will be shown more clearly under the discussion of proper methods of removal.

When interpreting pathology about the apex of the tooth as revealed in the roentgenogram, it is important to remember that the most common source of this disease is in the pulp chamber of the tooth itself, that as the infection progresses the pus follows the path of least resistance which is out through the apex. As the pus affects the bone about the apex of the tooth absorption of the lime salts takes place so that one is able to demonstrate the change in density on the roentgenogram.

This is essentially a slow chronic process, preceding which, death of the tooth pulp has occurred. This means then that an area of decalcification about the apex of a tooth has little or no significance unless the tooth is dead. The pulp may

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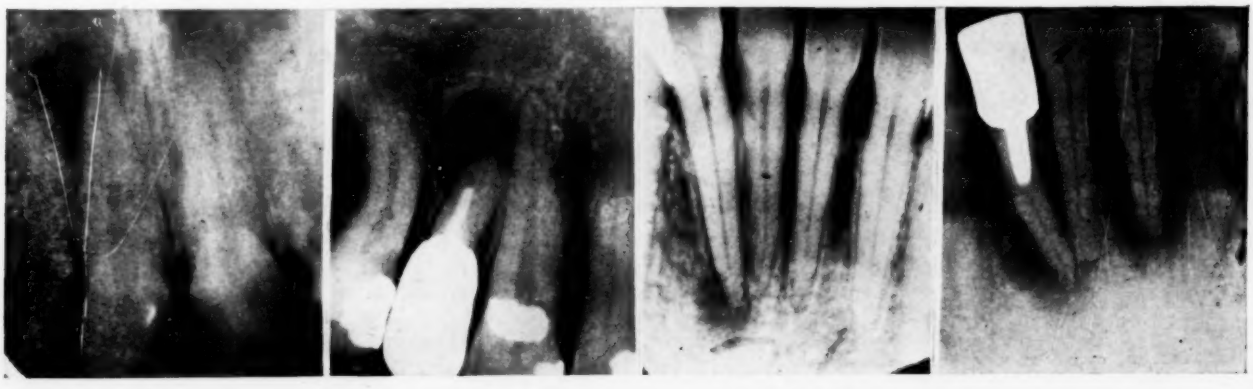


Fig. 1—Cavity in crown, death of pulp and pathology at apex.
Fig. 2—Root canal partially filled, pathology at apex.
Fig. 3—Trauma of tooth, death of pulp, pathology at apex.
Fig. 4—Angulated root, canal partially filled, pathology at apex.

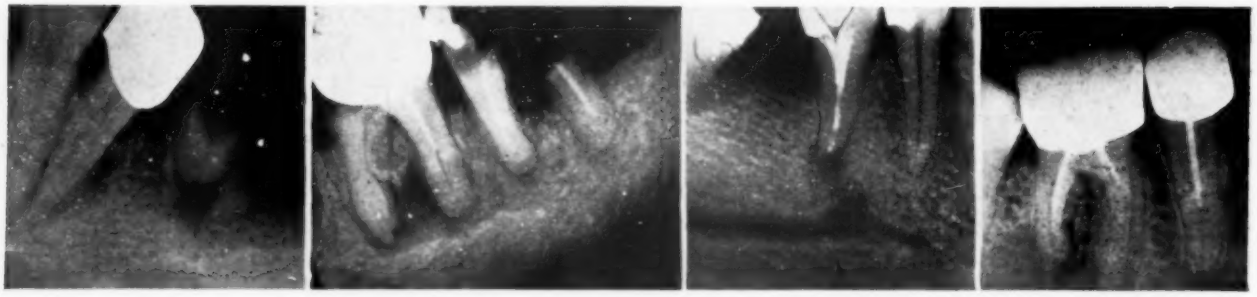


Fig. 5—Root left in jaw with pathology at apex. Crowned tooth, death of pulp, pathology at apex.
Fig. 6—Roots devitalized, pathology at apices. Large cavity under crown, interradicular pathology, distal root only partially filled.
Fig. 7—Periapical pathology communicating with the mandibular canal.
Fig. 8—Partial absorption of the distal root of the first molar due to periapical pathology.

have died following infection from a dental tubule, from a cavity, from repeated thermic shock transmitted through large fillings, or the pulp may have been purposely removed during a dental operation.

Types.

Abscesses at the root end of teeth fall into two classes, the acute and the chronic. The acute type is characterized by intense pain which comes on rapidly and continues until the pulp dies or until relief is given by the dentist. This type of abscess cannot be visualized on the roentgenogram because relief must be had before sufficient time has elapsed to produce absorption of the lime salts in the periapical bone. This type of abscess has been characterized by Thoma and others as destructive in character.

The chronic abscess, on the other hand, presents an entirely different clinical picture. This type of abscess is only found when the pulp of the affected tooth is dead. Nature's telegraph line is down so that no matter how extensive the abscess may be the patient has no warning except in an acute exacerbation. The absence of clinical symptoms accounts for the long duration of this type of abscess before its presence is recognized. In fact, usually the roentgenogram is the sole method of proving its existence. As this type of abscess advances nature attempts to limit its progress. This is done by throwing out a lining of fibrous tissue on the walls of the abscess cavity in the bone. If this effort of nature is successful the abscess remains small in size and is called a granuloma. When such a tooth is extracted, occasionally all or a part of this pus filled sac will come out with the tooth; more often, however, the sac remains in the bone after the tooth has been extracted. This fact necessitates surgical removal of the disease, the proper technique for which we shall describe later. This type of root-end abscess is frequently called "productive" to distinguish it from the destructive acute abscess. Such an abscess may be found at the apex, lateral to the root or between the roots of a multirooted tooth.

There are a number of different causes of apical abscesses:

1. Trauma: When one receives a blow on a tooth it is frequently fractured, sometimes in the crown, sometimes in the root. In case the fracture occurs through the crown the pulp may receive sufficient injury to cause its death with consequent abscess formation. On the other hand if the fracture occurs through the root the pulp is violently injured and generally dies, resulting in abscess formation. In other cases where fracture does not occur the trauma is sufficient to cut off the blood supply and in this manner cause death of the pulp and resultant abscesses.

2. Pus pockets: In advanced pyorrhea with denudation of the tooth the process may extend completely around the apex. In this manner a periapical abscess would be formed but would communicate with the mouth at the gum margin.

3. Decay of a tooth: Decay in the crown of the tooth or down on the side near the gum margin may pass unnoticed. When this area extends deeply enough the pulp becomes infected, dies and a periapical abscess may result.

4. Infected adjacent teeth: Occasionally the infection from an adjacent tooth may pass through the cancellous bone and infect the pulp of a primary sound tooth. This is not a frequent condition as the healthy pulp is very resistant to infection from this source.

5. Previous dental operations: A very large per cent of the chronic periapical abscesses are formed in teeth that have had previous dental operations performed on them.

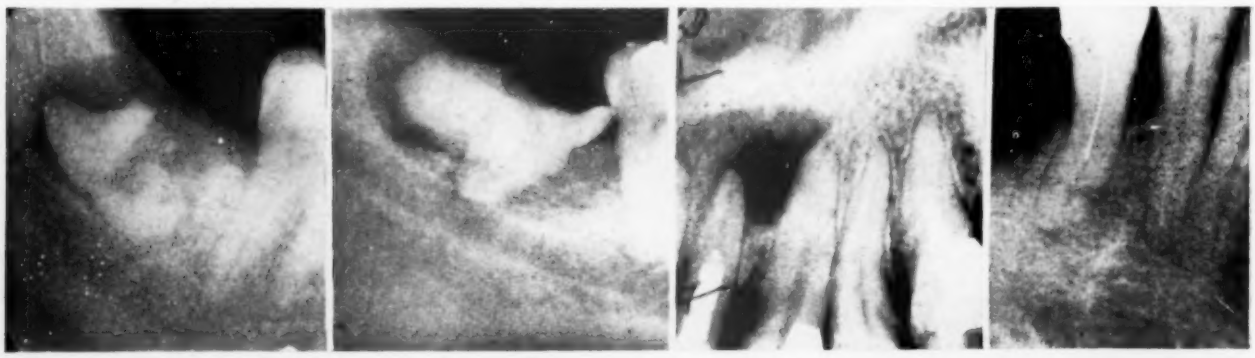


Fig. 9—Impacted third molar, crown fractured by previous effort at extraction, extensive pathology about apices communicating with mouth.
Fig. 10—Impacted third molar, pathology at apices. Crown of second molar destroyed, pathology at apices communicating with mandibular canal.
Fig. 11—Root canal of lateral incisor partially filled, pathology at apex. Involvement of cuspid by direct extension.
Fig. 12—Root canal partially filled, pathology at apex, hypercementosis.

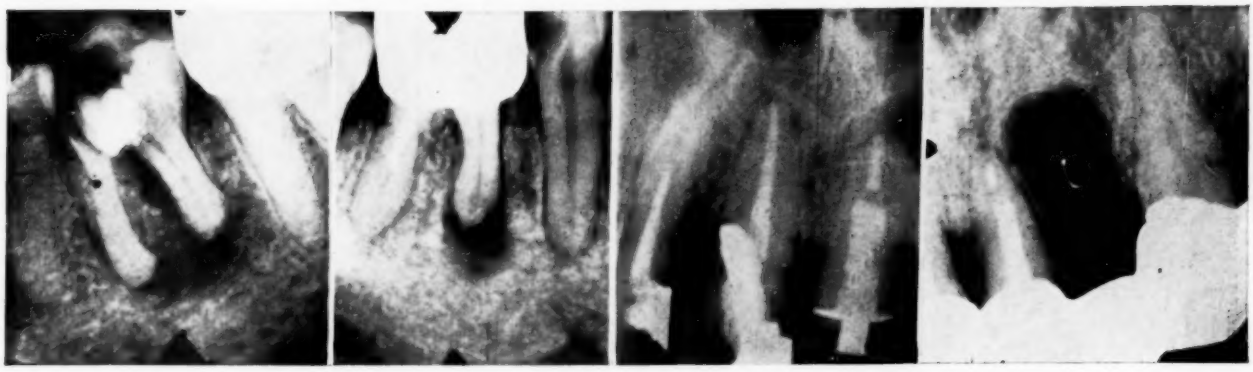


Fig. 13—Large cavity in crown, death of pulp, pathology at apices.
Fig. 14—Crowned tooth, pathology at apices.
Fig. 15—Peg perforating lateral aspect of tooth.
Fig. 16—Metallic foreign body in alveolar process with bone absorption around it.

(a) Large fillings in the crown frequently necessitate drilling quite close to the pulp in order to get rid of all the disease and provide a suitable setting for the filling.

(b) Crowns which require much grinding for proper fitting also endanger the life of the pulp. Both of these mechanical conditions may be the source of repeated

(c) Thermic shocks, since the metallic fillings and crowns are much better conductors of heat and cold than the normal enamel of the tooth.

(d) Root canal work is frequently done in an infected field so that the instrument used may push some infection down through the apex into the periapical bone, thus causing an abscess about the apex of the tooth.

(e) Frequently the root canal is sharply angulated or narrowed so that filling cannot be properly done. This leaves a space near the apex which contains a portion of dead pulp, a blood clot or serous exudate, which acts as an excellent culture medium for bacteria. A periapical abscess usually results.

(f) Occasionally during a dental operation a broach or some other metallic instrument is broken off and remains in the root canal. Periapical abscess frequently follows this.

(g) Rarely, a chemical substance used during a root-canal operation is forced out through the apex of the tooth and causes a root-end abscess.

(h) In teeth with angulated roots, the wall of the root may be perforated during the dental operation. This gives rise to a lateral abscess.

6. Hematogenous: It is possible that some abscesses of the pulp canal are introduced through the blood stream. The percentage of infection introduced in this manner must be exceedingly small.

Fig. 17—Broaches broken off in root canals.
Fig. 18—Pathology about apices of upper right first molar which perforated through the cheek as shown in figure 19.
Fig. 19—Photo of sinus in skin communicating with diseased area at apex of first molar.

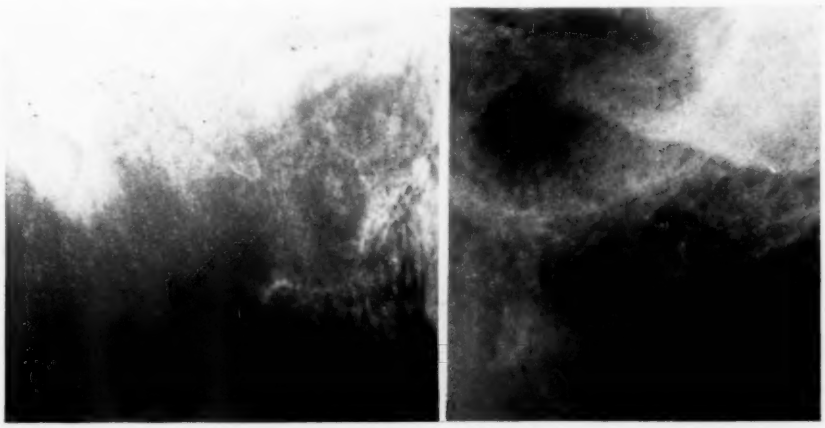


Fig. 20—Bone destruction extending through the floor of the antrum.
Fig. 21—Granuloma in alveolar process seventeen years after extraction. Proven at operation.

Pathology.

The infection is introduced into the pulp canal in one of the ways described above and results in either a pulpitis and death of the pulp or in infection introduced into the pulp canal by mechanical means. Pus then forms in the small pulp canal and as the quantity increases it passes along the path of least resistance out of the apex into the cancellous bone. From this point on one is dealing with a low grade chronic ostitis. The pus in the bone is subjected to repeated compression during the act of mastication, which forces it into the small openings of the cancellous bone. Were it not for the fibrous membrane thrown around the pus by nature in her defense, the extent of the disease would be much greater than is usually found. The pressure of the pus into the lymphatics and venules of the cancellous bone of the jaw gives the avenue of entrance into the general circulation and subsequent disease in distant parts of the body. It is well to fix clearly in mind that the cancellous bone of the alveolar process is transitory in character. When its pur-

Fig. 22.—Destruction of the floor of the nose complicating root end abscess.

Fig. 23—Destruction of the palate complicating root end abscess.

pose in life, the setting for the teeth, has been served nature takes it away. The narrow jaw of the elderly who have been without teeth for a number of years furnishes abundant proof of this statement. When the alveolar process becomes diseased proper treatment will take advantage of this fact.

Complications.

1. By Direct Extension: (a) Infected cyst.—In cases where the pus organisms are more virulent than usual the fibrous membrane thrown out by nature does not stop the process of the abscess but on the contrary the bone is slowly absorbed and the fibrous capsule thinned out until the cavity occupies the entire width of the jaw and even bulges the cortex. At this stage surgical aid is usually sought by the patient.

(b) Extensive necrosis of the jaw bone.—In a small per cent of cases the infective organism is very virulent, invading bone rapidly and causing an extensive osteomyelitis.

(c) Rupture into the antrum of Highmore.—As one reviews the relationship of the teeth to the floor of the antrum a keen appreciation of the ease with which a periapical abscess can rupture into the antrum is gained. The apices of the teeth frequently project into the antral cavity, the thin floor of which curves over them. A small periapical abscess will erode this thin layer of bone and push the membrane lining the antrum ahead of it. The elasticity of this membrane saves many patients from an antral empyema. In other cases the antral membrane is perforated, resulting in empyema of the antrum of dental origin.

(d) Rupture into the mandibular canal.—In the lower jaw it is no uncommon thing to find a periapical abscess draining directly into the mandibular canal.

(e) Rupture into the nares.—Occasionally an abscess of one of the anterior teeth finds its way upward and ruptures into the nasal cavity; where the pyogenic organism is of low virulence little discomfort is experienced but when a general osteomyelitis occurs the floor of the nose may be destroyed.

(f) Rupture into the palate.—Often one sees an abscess, especially on the apex of a lingual root of an upper molar, which ruptures through the palate.

(g) Rupture through the cheek.—Rarely an abscess will dissect its way through the soft tissues of the cheek, pointing under the skin, and when lanced forms a sinus from which pus discharges.

2. Neurological: Pain may be referred to any branch of the fifth nerve, because of irritation of one branch by a chronic abscess.

3. By Distant Metastases: (a) Myositis.—Muscular pains and aches in patients suffering from abscessed teeth are frequently relieved by clearing out the infection. Rosenow has proved the presence of the same streptococcus in the muscle and the tooth and is able to produce myositis at will by injecting that particular strain into the blood: (b) neuritis, (c) arthritis, (d) endocarditis, myocarditis and pericarditis, (e) gastric and duodenal ulcer, (f) appendicitis, (g) cholecystitis, (h) iridocyclitis, (i) nephritis, (j) pancreatitis, (l) thyroiditis, (m) osteomyelitis, (n) spinal myelitis, all have been proved due to hematogenous infection with certain strains of streptococcus found in the teeth. For a fuller discussion the reader is referred to, "Focal Infection," by Billings, and to the work of Rosenow in current medical literature.

Symptoms and Physical Findings.

(a) History: The history of previous acute abscess, trauma or dental operation should lead one to search diligently for chronic periapical abscess.

(b) Neurological signs: A patient who has suffered from chronic, long continued facial neuralgia usually has some point of irritation along the fifth nerve. The most frequent cause is a chronic periapical abscess.

(c) Dull ache: Some patients complain of a dull ache in the jaw affected by chronic periapical abscess. This is more apt to be found

Fig. 24

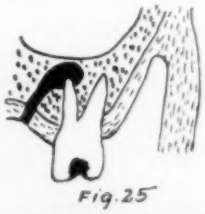


Fig. 25

Fig. 26

Fig. 27

Fig. 28

Fig. 24—Drawing showing path followed by periapical abscess perforating the gum on the buccal side.
Fig. 25—Drawing showing path followed by perialical abscess perforating the palate.
Fig. 26—Drawing showing path followed by periapical abscess perforating the floor of the antrum.
Fig. 27—Drawing showing the path followed by periapical abscess perforating the floor of the nose.
Fig. 28—Drawing showing path followed by periapical abscess perforating the cheek.

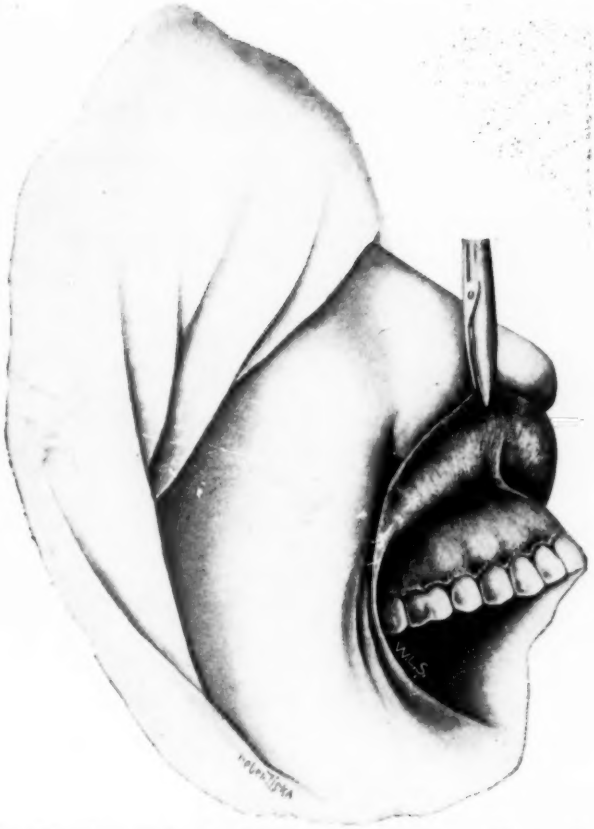


Fig. 29—Diagramatic drawing of the superior maxillary. Assuming that the pathology of the teeth and body of the jaw requires the removal of all the teeth.

Fig. 30—Illustrates case after the removal of the teeth, the mucoperiosteum denuded from the bone and lifted upward and above the root ends of the teeth.

in the presence of large areas of involved bone than in small ones.

(d) Tender tooth: The affected tooth is usually tender to pressure or may seem longer than the other teeth.

(e) Thickening of bone: Where the disease has involved a large area of bone coming close under the cortex, the bone becomes wider and feels thicker than the opposite side. Sometimes the cortex becomes so thin that one can detect a papyraceous feeling. This is especially true in the infected cyst.

(f) Routine examination: When the physician is searching for the cause of focal infection the teeth should always be thoroughly examined. In patients past middle life a very large percentage will be found who have one or several periapical abscesses of varying size.

(g) Roentgen ray findings: Of all the findings in the diagnosis of chronic periapical abscess those revealed by the careful roentgen ray examination are the most valuable. The location, size and contour of the diseased area is thus visualized. The presence of various complications is also shown. With this information the oral surgeon can carefully outline his method of attack in advance, thus rendering the patient the best possible service.

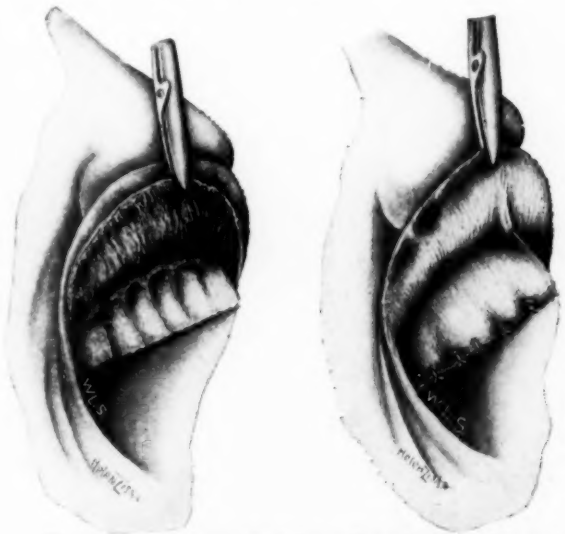


Fig. 31—The mucoperiosteum reflected up to the root ends of the teeth and the external alveolar plate along with diseased tissue attended to under the eye. The lingual, buccal, gingival mucosa trimmed. No jagged bone edges are left.

Fig. 32—The musoperiosteum carried back into position and sutured with horsehair. I advise continuous horsehair suture in the hands of those experienced, either button hole or over and over stitch.

TERMINATION.

1. Resolution: Periapical abscesses never entirely heal of their own accord. Operative interference is always necessary.

2. Scar bone: In some cases where the abscess has existed for a long time and the virulence of the invading organism is low the roentgenogram will show scar bone around the apex of the tooth. This indicates repair by nature filling up part of the area which has previously been diseased. Even in cases where this has taken place there will

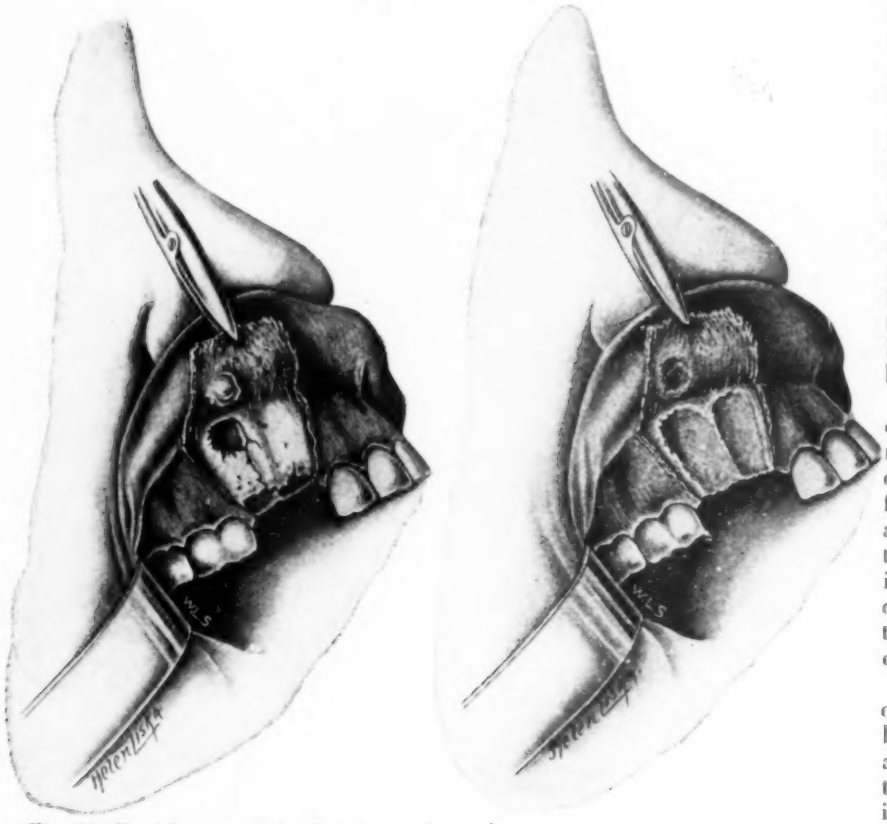


Fig. 33—Partial external alveolectomy ready to close.
Fig. 34—Shows conditions of the bone often revealed after the flap is laid back, the granuloma attached at the mucoperiosteum. It is necessary in many instances to employ the knife in order to remove the diseased tissue.

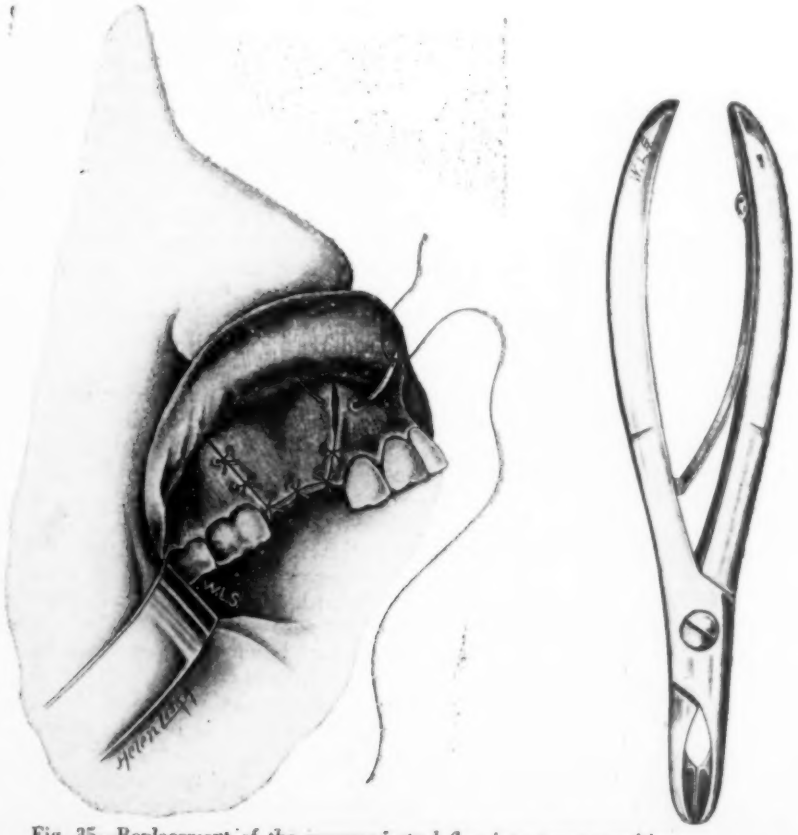


Fig. 35—Replacement of the mucoperiosteal flap into proper position.
Fig. 36—Special rongeur forcep designed to better carry out certain steps of this class of surgery. Presented to the profession for what it is worth.

still be a small abscess area proximal to the apex of the tooth. This process is sometimes called osteosclerosis.

3. Hypercementosis of the root: In other cases of long duration the roentgenogram will show thickening, or clubbing of the root. In such cases the virulence of the infecting organism has been low and the cementum of the tooth has been stimulated to hyperactivity so that additional layers of cement have been laid around the root, resulting in a hypercementosis.

4. Absorption of the root: In other cases one will note that the roentgenogram shows the root-end considerably shortened or narrowed for a distance from the apex. The abscess has produced absorption of the root-end rather than extension into the bone. This is the exception to the general rule since the tooth is usually more resistant to disease than is the alveolar process.

5. Sinus formation: In other cases the abscess at the root-end slowly progresses, extending through the alveolar process under the periosteum, then through the periosteum into the soft tissues and finally pointing at the surface as a "gum boil" which when lanced forms a chronic discharging sinus. These sinuses may open in the mouth on the buccal or lingual side of the aveolar process or through the palate or may open into the antrum of Highmore, or into the nose or even through the skin of the cheek. Abscesses of the lower teeth may dissect their way through the soft tissues of the skin or submaxillary region. In two cases coming under our observation the abscess followed down through the soft tissues of the neck, coming to the surface on the anterior chest wall below the clavicle. Sterile water poured into the sinus in the mouth came out through the sinus on the chest wall.

Treatment.

1. Underlying Principles: (a) Anesthetic. The same common sense principles should govern the administration of an anesthetic in oral surgery as governs the same procedure in general surgery. Experience has shown that the patient should be in the recumbent position during the administration of either a general, local or nerve block anesthesia for oral surgery. Syncope and heart strain are thus avoided. In our hands novocaine-adrenalin nerve-block anesthesia has given the most desirable results.

(b) Preservation of adjoining sound teeth: The purpose of an operation in the mouth is to remove all

the disease and at the same time preserve the normal as far as possible. This can only be done by careful painstaking effort. The slap-stick method does not lead to this end.

(c) Visualization of the diseased area: The oral surgeon should actually see the disease which he is attempting to remove so that he will know when he has completely eradicated it.

(d) Removal of all disease: Pulling out a tooth and leaving the infected granuloma and diseased bone in the jaw has proved futile. Removal of the tooth and curettage of the socket has had many disappointing results. The only satisfactory method is thorough and complete removal of every vestige of disease.

(e) Absence of postoperative febrile reactions: Many dentists, oral surgeons and physicians have had patients develop serious febrile reactions and even die following the simple extraction of an abscessed tooth. (*Focal Infection*—Billings, 1917, p. 135). When the work is properly done and all the diseased bone removed the patients rarely if ever have postoperative fever. This has proved universally true in hundreds of cases done by one of us (W. L. S.).

(f) Repair by primary union: The medical and dental profession as well as the laymen have become so accustomed to having open infected wounds in the mouth following extractions that they accept it as a matter of course. The statement that removal of diseased teeth under proper surgical technique results in healing by primary union sounds so like a fairy tale that many otherwise well trained professional men scoff at the idea. The fact remains, however, that this is not only possible but is actually being done in the routine work day after day.

(g) Early application of dentures: Where the diseased process has been removed according to the rules laid down above, healing by primary union occurs, making it possible to fit permanent dentures at the end of three to six weeks. This is a great advantage as compared with six to eighteen months as is usual after ordinary methods of extraction.

Technique.

(a) Position of the patient: In all cases the patient should be in the horizontal position. Syncope and heart embarrassment are thus avoided and the confidence of the patient is more easily gained. This position also enables the surgeon to stand on either side or above the head of the patient and look directly into the field of operation which is illuminated by a light on the surgeon's headband.

(b) Anesthetic: Novocaine- adrenalin two per cent. nerve-block anesthesia, has proved most valuable. Time should be allowed for the anesthetic to take place, usually about fifteen minutes.

(c) Incision: Having decided beforehand what teeth are to be removed, an incision is made, beginning on the side of the alveolar process well away from the diseased area and curving upward a short distance away from the cemento-enamel junction of the sound tooth adjacent to the field of operation. The line of incision is then carried back to a corresponding location at the other end of the field of operation.

(d) Mucoperiosteal flap: With a periosteal elevator the mucoperiosteal flap is then laid back away from the alveolar process on both sides, on the buccal side down beyond the alveolar process, on the lingual side to the base of the process.

(e) Extractions: The diseased teeth are then carefully lifted out of their sockets.

(f) Removal of diseased bone: The diseased bone can now be seen and is curetted and chiseled away, the rough edges being smoothed by means of a specially devised rongeur forceps which has a cutting edge on one side. The whole alveolar process is removed down to healthy hard bone. Boyd Gardner prefers to remove the outer portion of the alveolar process first, calling this the "standard technique."

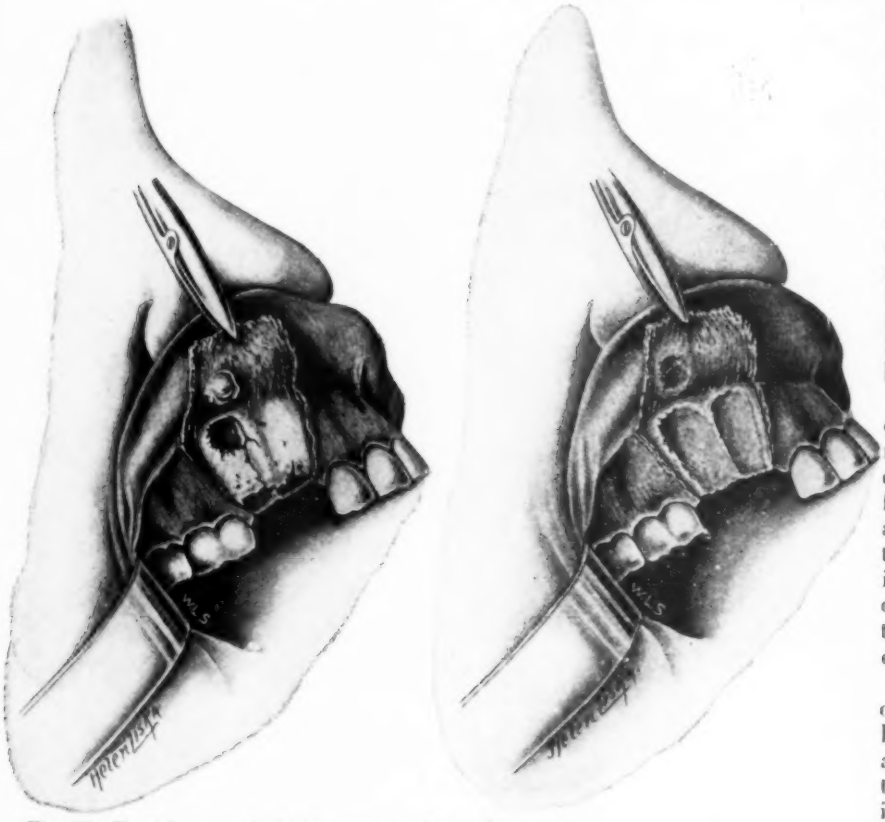
(g) Treatment of wound: The wound is then sponged free of every particle of loose bone and thoroughly dried.

(h) Suture: After bleeding has stopped the mucoperiosteal flaps are carefully fitted over the bone, trimming them where needed, and horsehair sutures are inserted in such a manner that they are closed without tension. A hot, moist pack is placed against the suture line and the patient is told to bite down upon it, holding it firmly against the flaps for a few minutes. This presses the mucoperiosteal flaps firmly against the bone, forcing out any excess of blood underneath and stopping any further bleeding.

(i) After care: Where the contour of the postoperative field is such that the mucoperiosteal flaps fit closely to the bone the patient is observed daily for one week and the sutures are removed in from three to six days. If the flap does not fit snugly, as often occurs in the lower third molar region, a small glass irrigation point is introduced between the sutures and daily irrigation with 0.5 per cent lysol solution is given.

The wound is thoroughly healed by the end of two weeks and the tenderness disappears soon thereafter. Since the major portion of the alveolar process has been removed during the operation there is no need to wait for its absorption by nature. The patient is never troubled by sharp spicules of bone as so often follows simple extraction. As soon as the tenderness has disappeared the patient can have permanent dentures fitted since there will be little further shrinkage. In the majority of cases three or four weeks is ample time, seldom more than six weeks.

Removal of abscessed teeth by the method described above opens a new era in oral surgery, making results possible in every case, which heretofore were thought impossible of attainment.



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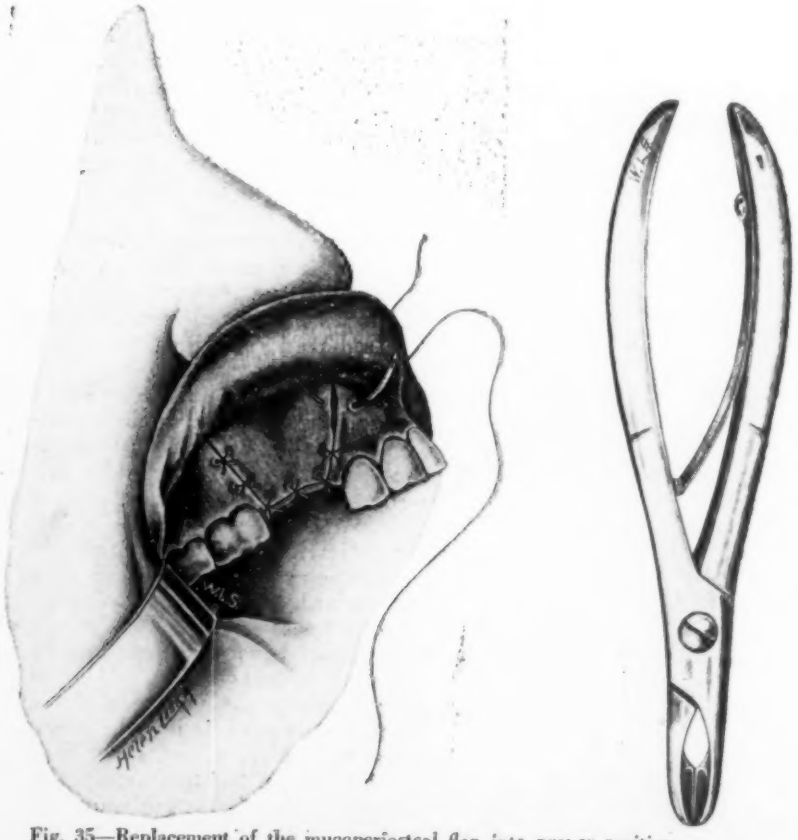

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Fig. 36—Special rongeur forcep designed to better carry out certain steps of this class of surgery. Presented to the profession for what it is worth.

still be a small abscess area proximal to the apex of the tooth. This process is sometimes called osteosclerosis.

3. Hypercementosis of the root: In other cases of long duration the roentgenogram will show thickening, or clubbing of the root. In such cases the virulence of the infecting organism has been low and the cementum of the tooth has been stimulated to hyperactivity so that additional layers of cement have been laid around the root, resulting in a hypercementosis.

4. Absorption of the root: In other cases one will note that the roentgenogram shows the root-end considerably shortened or narrowed for a distance from the apex. The abscess has produced absorption of the root-end rather than extension into the bone. This is the exception to the general rule since the tooth is usually more resistant to disease than is the alveolar process.

5. Sinus formation: In other cases the abscess at the root-end slowly progresses, extending through the alveolar process under the periosteum, then through the periosteum into the soft tissues and finally pointing at the surface as a "gum boil" which when lanced forms a chronic discharging sinus. These sinuses may open in the mouth on the buccal or lingual side of the aveolar process or through the palate or may open into the antrum of Highmore, or into the nose or even through the skin of the cheek. Abscesses of the lower teeth may dissect their way through the soft tissues of the skin or submaxillary region. In two cases coming under our observation the abscess followed down through the soft tissues of the neck, coming to the surface on the anterior chest wall below the clavicle. Sterile water poured into the sinus in the mouth came out through the sinus on the chest wall.

Treatment.

1. Underlying Principles: (a) Anesthetic. The same common sense principles should govern the administration of an anesthetic in oral surgery as governs the same procedure in general surgery. Experience has shown that the patient should be in the recumbent position during the administration of either a general, local or nerve block anesthesia for oral surgery. Syncope and heart strain are thus avoided. In our hands novocaine-adrenalin nerve-block anesthesia has given the most desirable results.

(b) Preservation of adjoining sound teeth: The purpose of an operation in the mouth is to remove all

the disease and at the same time preserve the normal as far as possible. This can only be done by careful painstaking effort. The slap-stick method does not lead to this end.

(c) Visualization of the diseased area: The oral surgeon should actually see the disease which he is attempting to remove so that he will know when he has completely eradicated it.

(d) Removal of all disease: Pulling out a tooth and leaving the infected granuloma and diseased bone in the jaw has proved futile. Removal of the tooth and curettage of the socket has had many disappointing results. The only satisfactory method is thorough and complete removal of every vestige of disease.

(e) Absence of postoperative febrile reactions: Many dentists, oral surgeons and physicians have had patients develop serious febrile reactions and even die following the simple extraction of an abscessed tooth. (*Focal Infection*—Billings, 1917, p. 135). When the work is properly done and all the diseased bone removed the patients rarely if ever have postoperative fever. This has proved universally true in hundreds of cases done by one of us (W. L. S.).

(f) Repair by primary union: The medical and dental profession as well as the laymen have become so accustomed to having open infected wounds in the mouth following extractions that they accept it as a matter of course. The statement that removal of diseased teeth under proper surgical technique results in healing by primary union sounds so like a fairy tale that many otherwise well trained professional men scoff at the idea. The fact remains, however, that this is not only possible but is actually being done in the routine work day after day.

(g) Early application of dentures: Where the diseased process has been removed according to the rules laid down above, healing by primary union occurs, making it possible to fit permanent dentures at the end of three to six weeks. This is a great advantage as compared with six to eighteen months as is usual after ordinary methods of extraction.

Technique.

(a) Position of the patient: In all cases the patient should be in the horizontal position. Syncope and heart embarrassment are thus avoided and the confidence of the patient is more easily gained. This position also enables the surgeon to stand on either side or above the head of the patient and look directly into the field of operation which is illuminated by a light on the surgeon's headband.

(b) Anesthetic: Novocaine- adrenalin two per cent. nerve-block anesthesia, has proved most valuable. Time should be allowed for the anesthetic to take place, usually about fifteen minutes.

(c) Incision: Having decided beforehand what teeth are to be removed, an incision is made, beginning on the side of the alveolar process well away from the diseased area and curving upward a short distance away from the cemento-enamel junction of the sound tooth adjacent to the field of operation. The line of incision is then carried back to a corresponding location at the other end of the field of operation.

(d) Mucoperiosteal flap: With a periosteal elevator the mucoperiosteal flap is then laid back away from the alveolar process on both sides, on the buccal side down beyond the alveolar process, on the lingual side to the base of the process.

(e) Extractions: The diseased teeth are then carefully lifted out of their sockets.

(f) Removal of diseased bone: The diseased bone can now be seen and is curetted and chiseled away, the rough edges being smoothed by means of a specially devised rongeur forceps which has a cutting edge on one side. The whole alveolar process is removed down to healthy hard bone. Boyd Gardner prefers to remove the outer portion of the alveolar process first, calling this the "standard technique."

(g) Treatment of wound: The wound is then sponged free of every particle of loose bone and thoroughly dried.

(h) Suture: After bleeding has stopped the mucoperiosteal flaps are carefully fitted over the bone, trimming them where needed, and horsehair sutures are inserted in such a manner that they are closed without tension. A hot, moist pack is placed against the suture line and the patient is told to bite down upon it, holding it firmly against the flaps for a few minutes. This presses the mucoperiosteal flaps firmly against the bone, forcing out any excess of blood underneath and stopping any further bleeding.

(i) After care: Where the contour of the postoperative field is such that the mucoperiosteal flaps fit closely to the bone the patient is observed daily for one week and the sutures are removed in from three to six days. If the flap does not fit snugly, as often occurs in the lower third molar region, a small glass irrigation point is introduced between the sutures and daily irrigation with 0.5 per cent lysol solution is given.

The wound is thoroughly healed by the end of two weeks and the tenderness disappears soon thereafter. Since the major portion of the alveolar process has been removed during the operation there is no need to wait for its absorption by nature. The patient is never troubled by sharp spicules of bone as so often follows simple extraction. As soon as the tenderness has disappeared the patient can have permanent dentures fitted since there will be little further shrinkage. In the majority of cases three or four weeks is ample time, seldom more than six weeks.

Removal of abscessed teeth by the method described above opens a new era in oral surgery, making results possible in every case, which heretofore were thought impossible of attainment.

Tumors of the Mediastinum*

EDWARD W. ROWE, B. S., M. D.

Lincoln, Nebraska

JUST as diagnosis in all parts of the body is becoming more accurate, so is the exact determination of mediastinal pathology becoming more certain. With the use of the roentgen ray there is an ease and definiteness in distinguishing between the tumors of the mediastinum in antemortem examinations. Early diagnosis has not been the rule because of the general good condition and indefinite symptoms of the patient. Pfahler says that in the very earliest stages malignant disease cannot be determined by any method. In the late stages no roentgenologist should mistake it. Gross lesions through the study of many roentgenograms have been traced back to their incipiency. As a result, the early recognition of the disease should be very much earlier than heretofore. The roentgen ray cannot, of course, trace it to the microscopical beginnings. Early diagnosis is not only a satisfaction and stimulant to our scientific interest, but may prevent mutilating operations or point out the necessity of deep therapy, which promises the greater hope for the relief of suffering, or the extension of life. It may also open the way for some form of treatment not yet discovered.

The most comprehensive description of mediastinal tumors is contained in Adler's monograph on "Primary Malignant Growths of the Lungs," which appeared in 1912. Since then roentgen diagnosis has made rapid strides toward perfection. Compare the statement of Adler's in 1912 with one of today. He said, "It was not very long ago that A. Frankel wrote that x-rays were of little service in the diagnosis of the lung tumors. Since then the x-rays have become a most remarkable and efficient aid to diagnosis in general, and there exists the well founded hope of their increasing efficiency. * * * The hope may reasonably be entertained that the systematic and proper application of the x-rays to the exploration of the chest, may be assured when no other means will give equally certain results." This last thought is but a conjecture and shows prophetic vision. That the hope has been realized may be proved by scanning the following excerpts from Nelson's Loose Leaf Living Medicine:

"Affections of the mediastinum are suggested by the nature of the complaint, suspected by the physical findings, but usually diagnosed by the x-ray. * * * X-rays when properly applied yield the most accurate information available. The anatomical seclusion of the mediastinum and its inherent ability to accommodate itself to gross changes * * * make it a difficult field to investigate clinically. Investigation by ordinary methods frequently discloses nothing, even though symptoms point definitely to some disease of the mediastinum. Our evidence is largely circumstantial, except that which the x-ray affords, and our diagnoses are largely inferential."

In some clinics the diagnosis of mediastinal tumors is seldom made. In others it may reach eighty or ninety per cent. This per cent is attainable by all if there is a careful correlation of the clinical history and the results of the roentgen examination. A routine roentgen examination should be made of all chests in which malignancy, primary or secondary, may be suspected.

Anatomical descriptions of the mediastinum are tedious. A study of the mediastinum and the various relations of its contents is of great value in the clinical considerations of the space. A brief mention of some salient features is important to our study.

The mediastinum is the space left in the median line of the chest by the non-approximation of the two pleurae. It extends from the sternum in front to the spine behind, and contains all the viscera in the thorax excepting the lungs. There are two parts to the mediastinum, an upper, above the level of the pericardium, and a lower. This lower is again subdivided into three parts: That part which contains the pericardium and its contents, the middle mediastinum; that part which is in front of the pericardium, the anterior mediastinum; and that part which is behind the pericardium, the posterior mediastinum.

The upper and posterior mediastinum are the most important in our consideration, though new growths may arise in any part. The heart and pericardium are by custom considered elsewhere. The amount of stretching and displacement which occurs can only be appreciated at autopsy. Then the buried, infiltrated, flattened, distorted and displaced condition of the anatomical parts may be appreciated. To discuss in detail all the fine points of the anatomy of the mediastinum would carry us too far afield. But a brief enumeration of the important structures will open at once to the mind the possibilities of tumor growth. These important structures are the heart and pericardium, aorta, pulmonary artery, trachea, bronchi, esophagus, innominate artery, vagus nerve, phrenic nerve, azygos vein, lymphatic glands, and the thoracic duct.

The lymphatics are of great importance. A large number of primary malignancies arise from the lymphatic glands. Four principal groups are described by anatomists. A small substernal group lies in the superior mediastinum; two groups

*Read at the Annual Meeting of the American College of Radiology and Physiotherapy, Omaha, Sept, 18, 1923.

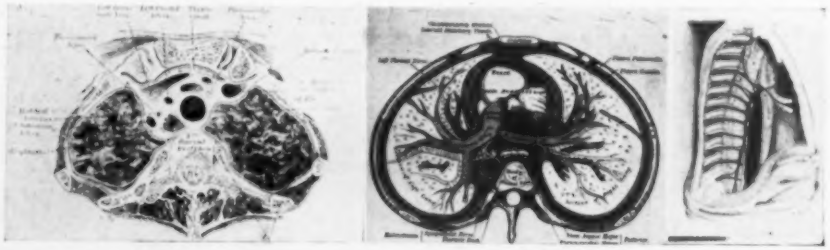

Fig. 1—The superior or upper mediastinum. Transverse section through the upper margin of the third dorsal vertebra (Gray's Anatomy).
Fig. 2—A transverse section of the thorax to show the lower or inferior mediastinum (Gray).
Fig. 3—Longitudinal section of the mediastinum (Gray).

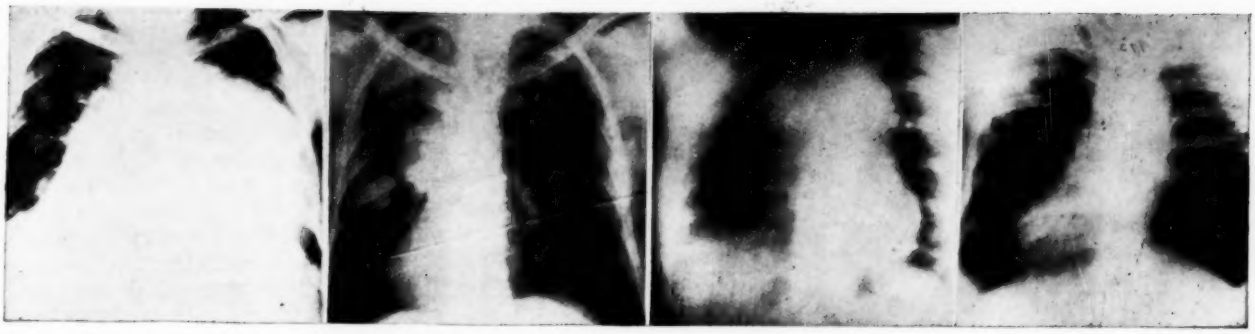

Fig. 4—Dilated heart mistaken for tumor of mediastinum.
Fig. 5—Metastases from hypernephroma. Male, aged 48.
Fig. 6—Hodgkin's disease. Female, aged 65.
Fig. 7—Primary sarcoma of the mediastinum. Male, aged 28.

at the hilus of the lung, the tracheobronchial and bronchopulmonary; two in intimate relation with the trachea, the main bronchi, the vagus, and the phrenic nerves; and a small isolated group, in the inferior mediastinum in relation with the esophagus, which receives afferents from the upper surface of the diaphragm and from the pericardium. The whole system of the mediastinal lymphatics is intimately connected and drained by means of a mediastinal trunk into the lymphatic duct. The lymphatics are all intimately connected, but those about the hilus of the lungs are the most commonly diseased, on account of their more immediate connection with the pharyngeal and cervical lymphatics.

It has been said that tumors may arise from any tissue in the mediastinum. The mediastinum is essentially mesoblastic and hence sarcomata and dermoids are the most frequent primary tumors. Because of its continuity to the breasts and the connection of the lymphatic system, secondary carcinoma from the breasts is the most common malignant condition found. Pfahler reports that out of 242 cases of carcinoma of the breast, 150 had metastases in the mediastinum and about the roots of the lungs. Carcinoma of the gall bladder and stomach seldom spread by metastasis to the mediastinum. It is common for carcinoma to break down and open pockets into a bronchus, esophagus or even into a large blood vessel. Tumors may arise in the lungs and invade the mediastinum.

Lymphosarcoma is the most common malignant tumor arising in the mediastinum. Sarcoma may occur at any age. A number of cases in children have been reported, but sarcoma usually appears between the ages of twenty and fifty. Sarcomas may be divided into two classes, spindle-cell, and the lymphosarcoma. The latter are irregular growths with sharply defined outlines, often somewhat nodular in shape, and extending far beyond the limits of the mediastinum. These tumors do not tend to invade or infiltrate the surrounding tissues, but often cause marked displacements of viscera. The spindle-cell sarcomas are generally invasive in character, have indefinite outlines and as a rule grow equally in all directions.

Primary carcinoma is rare and arises from the esophagus, the thyroid or large bronchi. They are invasive and spread in all directions, invading all the structures as they go as an infiltrating mass. They often extend into the lungs. The mass is not walled off. Its edges blend with the surrounding tissue. They cannot always be distinguished from malignancy arising by metastasis and tuberculosis, and malignancy may occur at the same time.

The median portion of the body is prone to teratomas. The benign tumors are either lipomas or dermoids. The dermoids either simple or teratoids. One in my series contained spangled fluid showing crystals of cholestrine obtained on puncture. Though these are usually considered benign, in the mediastinum they are all essentially malignant. They tend to shorten life. Even the dermoids cause death in ten or twelve years. Dermoids usually appear in the superior mediastinum and nearer the anterior wall, and extend to the right or left, and are seldom centrally located. They have sharp borders and easily transmit the aortic pulsation, and may appear expansile. It is said that hair, bones and teeth may appear and help in the identification.

In the roentgen examination of the mediastinum, plates or films are of more value than the roentgenoscope. The latter is of great value for it gives a view of the living, moving processes—pulsation, cardiac cycle and respiratory excursion—the torso can be turned in any direction. But roentgenograms, preferably stereoscopic, allow more careful and detailed study, and are usually diagnostic. Anterior position views supplemented by lateral or diagonal views are essential. The trachea can always be seen as a streak of in-

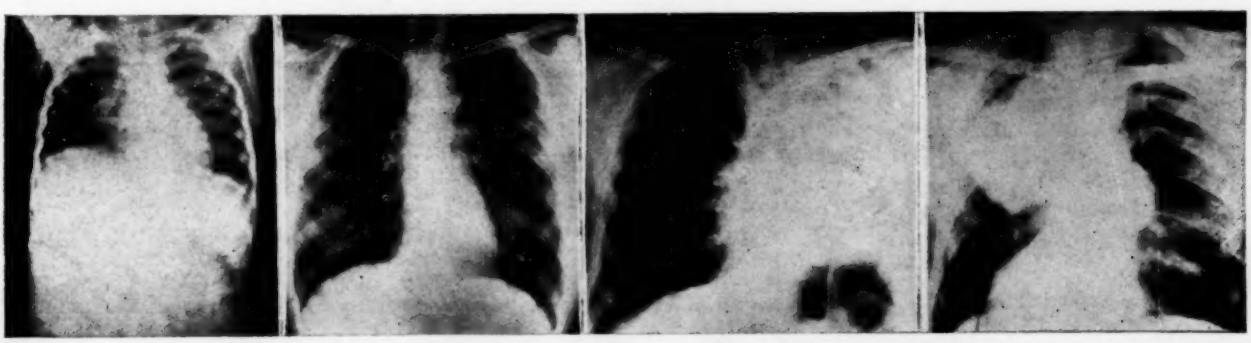

Fig. 8—Metastases from hypernephroma. Operation, nephrectomy. Patient aged 5 years.
Fig. 9—Miliary tuberculosis, healed. Placque in mediastinum. Female, aged 50.
Fig. 10—Pneumothorax. Male, age 28.
Fig. 11—Primary sarcoma of mediastinum. Male, aged 56.

creased radiolucency above the cardiac area. It is usually in the midline and is a good guide to the upper mediastinum. The heart may be displaced without any change in the trachea. Enlarged glands, new growths or deposits of fibrous tissue between various structures can be seen. With the sagittal view and the view obtained in looking from the right anterior and left anterior to the left posterior and right posterior, practically all parts of the mediastinum may be seen.

In passing, a word concerning the hyperplasia of lymph nodes must be mentioned. In children it is generally tuberculous, the glands often containing a deposit of calcium which is not found in malignant conditions. Miners and stone cutters often suffer from enlarged and sclerosed glands. Usually the picture in the lung helps to eliminate these conditions from malignant growths. Hodgkin's disease is one of the most frequent diseases affecting the mediastinum and is not per se a disease of the mediastinum. Hodgkin's disease usually shows in addition to the changes in the mediastinum which are like sarcoma, filmy, hazy infiltration in the lung and some glandular enlargement in the supraclavicular and axillary regions. Other lymph nodes are generally enlarged. Only a small node strictly localized in the mediastinum, which is rare in Hodgkin's, would complete a diagnostic opinion.

The inflammatory lesions of the mediastinum usually have a way of self elimination. An abscess from Pott's disease will show the calcareous deposits of tuberculosis. Diverticula of the esophagus occur high in the mediastinum or very low. A barium meal helps to eliminate them. Also the barium meal will eliminate hernia of the diaphragm or esophagus. Echinococcus cysts and hematoma rarely happen in the mediastinum. They may be seen at the base of the lungs.

Clinical signs of mediastinal tumors are somewhat different from signs of lung tumors. Common aids to differentiation are deviation of the trachea, fixation of the larynx, compression of the spinal cord, appearance of palpable tumors at the sternal notch, marked dysphagia and great wasting. These are due to invasion of the surrounding parts, compression and irritation of the bronchi and nerves. Cough may be paroxysmal, terrible to the extreme. Sputum is usually scanty and may be bloody. Dyspnea appears early as pressure increases.

The recognition of mediastinal tumors appears to be a diagnostic feat, judging from the frequent appearance in literature of cases singly reported. With the advent of the roentgen ray and its use in routine diagnosis, such cases will become more common.

This paper is not written primarily to discuss the treatment of these most distressing lesions. Too much emphasis cannot be laid upon the importance of diagnosis, the elimination of doubtful lesions and the avoidance of pitfalls in therapy. Except for the dermoid cysts in the mediastinum, surgery offers nothing at all. Medical treatment can only alleviate. The use of the short wave roentgen ray is the only therapy today which offers anything with the hope of retardation or the lengthening of life. A few cases have lived long enough after roentgen therapy to warrant the expectation that cures may yet be claimed.

Discussion.

Dr. Roscoe L. Smith: I have enjoyed the paper very much. It makes one feel that he should ray every patient for mediastinal trouble.

The patient Doctor Rowe mentioned with mediastinal tumor was a patient I happened to ray, and Doctor Covey of Lincoln saw the case. After localizing the tumor as best we could, he drove a needle through the chest wall and into the tumor and drew off about 50 c.c., an enormous amount. The wall of the cyst seemed to be very thick and leathery, and the fluid, I remember, was full of crystals. After straining it through an ordinary piece of gauze, the crystals remained and you could see them sparkle as the sun struck them.

Doctor Sherman: I had a queer experience in the diagnosis of mediastinal tumor in my office one day. I had a patient who complained of compression symptoms similar to those the Doctor described. That movable tumor reminded me of it. We took a roentgenogram of the chest and it showed a tumor in the left upper quadrant, which puzzled us very much. It was suggested that we give the patient a barium meal, and our diagnosis was immediately cleared up. It was a diverticulum from the esophagus and had a narrow pedicle. That is the reason I suppose we did not get a good picture the first trial. After two or three times, there was enough barium passed through the pedicle into the chamber so that we got a pretty picture of the diverticulum of the esophagus—rather a confusing thing from the standpoint of diagnosis.

Doctor Fouts: The question of differential diagnosis of these tumors is rather difficult, at least for me. It is easy enough as a general thing to make out the presence or absence of a growth by obscure shadows in the chest; but when it comes to saying just what is the pathology, it is a different proposition. It is safe to look elsewhere for other troubles. In many cases one will find evidences of malignancy elsewhere, and that the mediastinal tumors are secondary.

Doctor Rowe (Closing): The first point I wanted to make was that the diagnosis of mediastinal tumors with experience is easy and accurate.

Secondly, there has been a rapid change in the accuracy of diagnosis in the chest with the advent of the x-ray. I recall being on the program in Chicago and hearing Doctor Ballard discuss this subject, some eight years ago. I looked up everything I could and did not have much to say in the discussion. There has

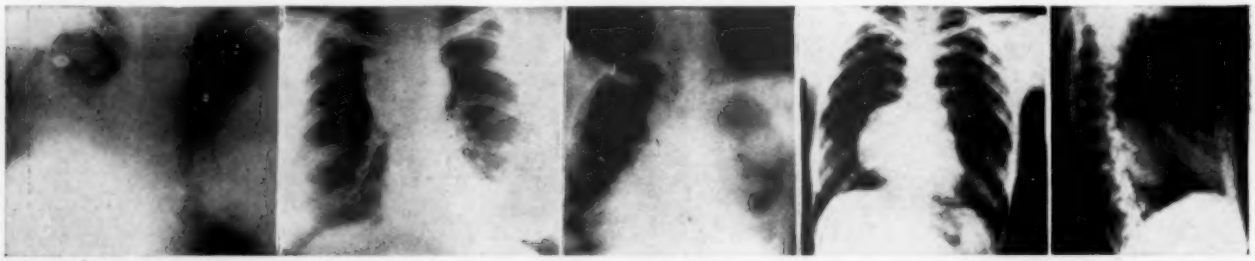

Fig. 12—Metastasis to lung. Operation upon the pelvis five years ago for fibroids (?). Female, aged 50.
Fig. 13—Carcinoma of the thyroid, substernal. Male, aged 55.
Fig. 14—Primary sarcoma of the mediastinum. Male, aged 65.
Fig. 15—Dermoid cyst of the mediastinum. Trocar showed spangled cholestrin crystals. Female, aged 30.
Fig. 16—Lateral view. Same as Figure 15.

been a great change in the last few years—a remarkable change—in understanding mediastinal tumors.

I also want to congratulate Doctor Smith further on the accuracy of his diagnosis in that case which I showed, after a very well known radiologist had already called it carcinoma of the mediastinum, and Doctor Smith had to prove his point. It was only by the introduction of the needle that he could prove it.

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The Enlarged Thymus Gland*

W. F. DREA, M. D.

Roentgenologist to Glockner Sanitorium and Hospital.

Colorado Springs, Colo.

THE thymus gland at birth consists of two lobes, pinkish in color, and separated by an intervening fissure. It is developed principally from the entodermal lining of the third branchial cleft on each side, and as tubular prolongations it migrates into the thorax where it occupies a position posterior to the sternum and ordinarily as low as the fourth rib. The upper parts of the two lobes project upward for varying distances into the neck. Posteriorly it rests upon the pericardium, the great vessels, and the trachea. Laterally are placed the mediastinal pleurae and lungs.

By most of the writers it is supposed to enlarge until about the second year when it either remains stationary or slowly decreases in size until puberty when a more rapid involution sets in, the parenchyma being replaced to a great extent by fat and connective tissue. Waldeyer has shown that the gland is never completely atrophied but may contain remains of original thymus tissue. There is more thymic tissue in the adult gland than is generally supposed.

Each lobe is made up of lobules separated by connective tissue derived from or continuous with the gland capsule. Each lobule in turn is made up of the cortex where the cells resembling lymphocytes are closely packed and the medulla where they are in smaller numbers.

There are two views regarding the origin of the small cells. The first is that they are derived from the epithelium cells originally lining the branchial clefts, the other is that they are the descendents of cells migrating into the anlage from the surrounding mesenchyme. Whatever their origin they are morphologically very similar to, if not identical with, the lymphocytes. These cells, similar to lymphocytes, are supported by a delicate meshwork, the cells of which are stellate in form and which anastomose freely and are derived from the epithelium of the third branchial cleft. The reticulum is unique among the lymphatic organs of the body as in every other instance the reticulum is derived from connective tissue cells. Under certain conditions of radiation these cells assume an epithelioid type according to observations by Regaud and Cremieu.

Another element in the gland is Hassall's corpuscle which is made up of flat cells arranged concentrically around a granular nucleated corpuscle in the center of the lobule.

This brief account shows that originally the thymus gland is epithelial in structure and finally is lymphoidal in its make up.

In experimental work done by others upon animals, radiation with x-rays has resulted in involution changes in the lymphocytes as early as three and one-half hours after the radiation. Depending upon the dosage applied the gland has had its weight reduced, as much as 90 per cent loss having been recorded when the animal (rabbit), was killed three days later. The net result is the disappearance of those lymphocytes affected, together with their nuclei, and this occurs, at the latest, two days after irradiation.

With moderate exposures, in one series of experiments upon cats, it was noted that the retrogressive changes reached their limit at the end of two weeks when regeneration began and the organ was restored to nearly its normal size at the end of a month.

Conflicting reports have been made as to the function and it is probably safe to state that no definite evidence has been brought forward to prove that there is a function. A. C. Heublein in April, 1920, quoting from a report by Park and McClure gives the following as conclusions reached by the latter after a series of experiments on dogs.

(1) The thymus gland is not essential to life in the dog.

(2) Extirpation of the thymus produces no detectable alteration in the hair, teeth, contour of the body, muscular development, strength, activity or intelligence of the experimental animal.

(3) Extirpation of the thymus probably does not influence growth or development. The possibility that it may cause retardation in development and delayed closure of the epiphyses, however, cannot be excluded absolutely.

(4) Extirpation of the thymus probably produces no alteration in the organs of internal secretion. It is possible that it produces well marked changes in the organs of internal secretion in the period immediately following thymectomy which was not covered by their experiments.

DIAGNOSIS.

Heublein places the symptoms in two groups, general and local.

Under the general symptoms are included muscular hypotonus, eczema, lack of resistance to acute infections, and convulsions.

Under the local symptoms are those arising from interference with respiration and deglutition due to pressure. These vary from a slight

*Read at Denver, Feb. 20, 1924.

creased radiolucency above the cardiac area. It is usually in the midline and is a good guide to the upper mediastinum. The heart may be displaced without any change in the trachea. Enlarged glands, new growths or deposits of fibrous tissue between various structures can be seen. With the sagittal view and the view obtained in looking from the right anterior and left anterior to the left posterior and right posterior, practically all parts of the mediastinum may be seen.

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Dr. Roscoe L. Smith: I have enjoyed the paper very much. It makes one feel that he should ray every patient for mediastinal trouble.

The patient Doctor Rowe mentioned with mediastinal tumor was a patient I happened to ray, and Doctor Covey of Lincoln saw the case. After localizing the tumor as best we could, he drove a needle through the chest wall and into the tumor and drew off about 50 c.c., an enormous amount. The wall of the cyst seemed to be very thick and leathery, and the fluid, I remember, was full of crystals. After straining it through an ordinary piece of gauze, the crystals remained and you could see them sparkle as the sun struck them.

Doctor Sherman: I had a queer experience in the diagnosis of mediastinal tumor in my office one day. I had a patient who complained of compression symptoms similar to those the Doctor described. That movable tumor reminded me of it. We took a roentgenogram of the chest and it showed a tumor in the left upper quadrant, which puzzled us very much. It was suggested that we give the patient a barium meal, and our diagnosis was immediately cleared up. It was a diverticulum from the esophagus and had a narrow pedicle. That is the reason I suppose we did not get a good picture the first trial. After two or three times, there was enough barium passed through the pedicle into the chamber so that we got a pretty picture of the diverticulum of the esophagus—rather a confusing thing from the standpoint of diagnosis.

Doctor Fouts: The question of differential diagnosis of these tumors is rather difficult, at least for me. It is easy enough as a general thing to make out the presence or absence of a growth by obscure shadows in the chest; but when it comes to saying just what is the pathology, it is a different proposition. It is safe to look elsewhere for other troubles. In many cases one will find evidences of malignancy elsewhere, and that the mediastinal tumors are secondary.

Doctor Rowe (Closing): The first point I wanted to make was that the diagnosis of mediastinal tumors with experience is easy and accurate.

Secondly, there has been a rapid change in the accuracy of diagnosis in the chest with the advent of the x-ray. I recall being on the program in Chicago and hearing Doctor Ballard discuss this subject, some eight years ago. I looked up everything I could and did not have much to say in the discussion. There has

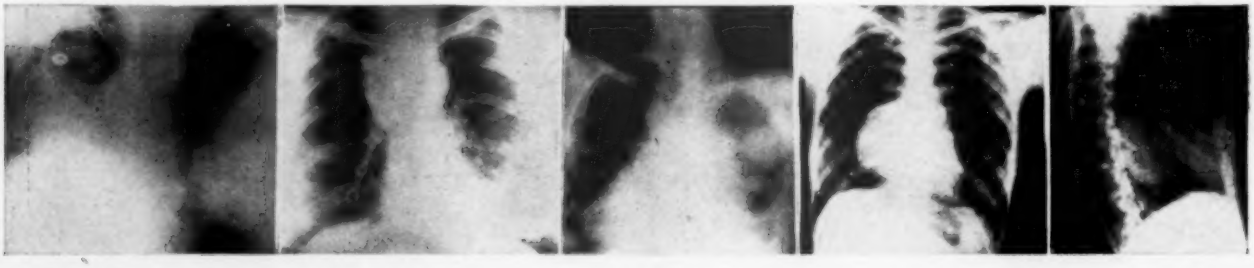

Fig. 12—Metastasis to lung. Operation upon the pelvis five years ago for fibroids (?). Female, aged 50.
Fig. 13—Carcinoma of the thyroid, substernal. Male, aged 55.
Fig. 14—Primary sarcoma of the mediastinum. Male, aged 65.
Fig. 15—Dermoid cyst of the mediastinum. Trocar showed spangled cholestrin crystals. Female, aged 30.
Fig. 16—Lateral view. Same as Figure 15.

been a great change in the last few years—a remarkable change—in understanding mediastinal tumors.

I also want to congratulate Doctor Smith further on the accuracy of his diagnosis in that case which I showed, after a very well known radiologist had already called it carcinoma of the mediastinum, and Doctor Smith had to prove his point. It was only by the introduction of the needle that he could prove it.

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The Enlarged Thymus Gland*

W. F. DREA, M. D.

Roentgenologist to Glockner Sanitorium and Hospital.

Colorado Springs, Colo.

THE thymus gland at birth consists of two lobes, pinkish in color, and separated by an intervening fissure. It is developed principally from the entodermal lining of the third branchial cleft on each side, and as tubular prolongations it migrates into the thorax where it occupies a position posterior to the sternum and ordinarily as low as the fourth rib. The upper parts of the two lobes project upward for varying distances into the neck. Posteriorly it rests upon the pericardium, the great vessels, and the trachea. Laterally are placed the mediastinal pleurae and lungs.

By most of the writers it is supposed to enlarge until about the second year when it either remains stationary or slowly decreases in size until puberty when a more rapid involution sets in, the parenchyma being replaced to a great extent by fat and connective tissue. Waldeyer has shown that the gland is never completely atrophied but may contain remains of original thymus tissue. There is more thymic tissue in the adult gland than is generally supposed.

Each lobe is made up of lobules separated by connective tissue derived from or continuous with the gland capsule. Each lobule in turn is made up of the cortex where the cells resembling lymphocytes are closely packed and the medulla where they are in smaller numbers.

There are two views regarding the origin of the small cells. The first is that they are derived from the epithelium cells originally lining the branchial clefts, the other is that they are the descendents of cells migrating into the anlage from the surrounding mesenchyme. Whatever their origin they are morphologically very similar to, if not identical with, the lymphocytes. These cells, similar to lymphocytes, are supported by a delicate meshwork, the cells of which are stellate in form and which anastomose freely and are derived from the epithelium of the third branchial cleft. The reticulum is unique among the lymphatic organs of the body as in every other instance the reticulum is derived from connective tissue cells. Under certain conditions of radiation these cells assume an epithelioid type according to observations by Regaud and Cremieu.

Another element in the gland is Hassall's corpuscle which is made up of flat cells arranged concentrically around a granular nucleated corpuscle in the center of the lobule.

This brief account shows that originally the thymus gland is epithelial in structure and finally is lymphoidal in its make up.

In experimental work done by others upon animals, radiation with x-rays has resulted in involution changes in the lymphocytes as early as three and one-half hours after the radiation. Depending upon the dosage applied the gland has had its weight reduced, as much as 90 per cent loss having been recorded when the animal (rabbit), was killed three days later. The net result is the disappearance of those lymphocytes affected, together with their nuclei, and this occurs, at the latest, two days after irradiation.

With moderate exposures, in one series of experiments upon cats, it was noted that the retrogressive changes reached their limit at the end of two weeks when regeneration began and the organ was restored to nearly its normal size at the end of a month.

Conflicting reports have been made as to the function and it is probably safe to state that no definite evidence has been brought forward to prove that there is a function. A. C. Heublein in April, 1920, quoting from a report by Park and McClure gives the following as conclusions reached by the latter after a series of experiments on dogs.

(1) The thymus gland is not essential to life in the dog.

(2) Extirpation of the thymus produces no detectable alteration in the hair, teeth, contour of the body, muscular development, strength, activity or intelligence of the experimental animal.

(3) Extirpation of the thymus probably does not influence growth or development. The possibility that it may cause retardation in development and delayed closure of the epiphyses, however, cannot be excluded absolutely.

(4) Extirpation of the thymus probably produces no alteration in the organs of internal secretion. It is possible that it produces well marked changes in the organs of internal secretion in the period immediately following thymectomy which was not covered by their experiments.

DIAGNOSIS.

Heublein places the symptoms in two groups, general and local.

Under the general symptoms are included muscular hypotonus, eczema, lack of resistance to acute infections, and convulsions.

Under the local symptoms are those arising from interference with respiration and deglutition due to pressure. These vary from a slight

*Read at Denver, Feb. 20, 1924.

cough to profound dyspnea with or without associated cyanosis. The respirations are usually audible and when the dyspnea is severe there may be a distinct inspiratory "crow." These symptoms may be precipitated or aggravated by exertion such as crying, feeding, fright, or by extension of the neck.

Pfahler quotes Lange as recommending x-ray examination for any of the following symptoms: "Inability to cry loudly, crowing respirations when crying, noisy respirations or wheezing, noisy respirations during sleep, difficulty in nursing, twitching, fretfulness and other nervous symptoms, vomiting or regurgitation (treating the thymus often relieves pylorospasm), feeble respiration, grunting as though the child wants to have a stool (this is due to difficult respiration and often stimulates bowel trouble), slow or retarded development, failure of child to gain in weight in spite of proper dietary measures, inanition, obesity, cough and hiccough."

John P. Parsons feels sure that if these enlarged thymus cases could be ruled out in some routine way the death rate in pneumonia and other severe infections would be much reduced, especially among babies and children. In summing up an article, Parson states, "I wish to point out that a baby that is born with an unusually large thymus may show very mild, local thymic symptoms from the start, that these symptoms may never attract attention until after the baby has had several colds; that these babies seem to be more subject to colds or infections; that repeated infections in a patient who may have only a moderately enlarged thymus and in whom no history of thymic symptoms is obtained may prove disastrous."

The observer will also often note a flabby child with retraction of the abdominal and intercostal muscles with a bulging of the upper and anterior part of the chest. With light percussion an area of dullness continuous with and to either side of the sternum will often be noted.

In addition to the history and the symptoms, an x-ray examination is advisable for the making of a diagnosis.

The normal thymus shadow cannot be recognized upon the x-ray film as it does not extend laterally far enough. But where the gland is definitely enlarged laterally it can be definitely recognized as encroaching upon the normal lung shadow on either one or both sides in the superior mediastinal region and below, merging with and indistinguishable from the heart shadow.

It is well, however, to sound a note of warning in regard to the technique employed. Upon deep expiration the diaphragm ascends and the superior vena cava will be filled with blood and its shadow appear to simulate in some cases that of an enlarged thymus. Again, in deep inspiration, the diaphragm descends and the heart lengthens out with the vena cava emptying itself. The effect now is to tend to make the enlarged thymus shadow less prominent. It is also important to see that the target of the tube is located in the vertical midplane of the body and that the patient be so held that the body is not rotated so that what are normal mediastinal shadows be not projected onto the lung shadow, thereby making it possible to make a false interpretation. Exposures should be as nearly instantaneous as is possible and in serial studies the same technique for target-skin distance, etc., should be employed.

Fig. 1—Male baby, six days old. Clinical diagnosis of enlarged thymus. Confirmed by x-ray examination. Patient improved and parents declined x-ray treatment.
Fig. 2—Same patient as in Figure 1. Now six months old. Return of symptoms due to enlarged thymus. Film shows that the thymus is still enlarged. X-ray treatment given.
Fig. 3—Two weeks after Figure 2 was taken. Patient improved. Second x-ray treatment given.

Where there is a decided widening laterally of the gland there will seldom be any difficulty in making a correct x-ray diagnosis. Where there is only a slight widening it is possible to confuse an enlarged thymus shadow with that produced as a result of an adenitis. Inasmuch as tuberculosis in infants frequently manifests itself in the tracheobronchial and less frequently the paratracheal glands, there will as a rule be little difficulty in differentiating the conditions when only the lower glands are involved but many times there will be considerable difficulty in distinguishing between the shadows caused by paratracheal glands and that of a moderately enlarged thymus, especially as a stridor may be present from pressure on the trachea by the enlarged paratracheal glands. However, the fact that paratracheal tuberculous glands are as a rule enlarged only on one side will aid in the differentiation, though the history, etc., together with the use of tuberculin will also help in the differentiation.

One other important fact must be considered in the x-ray diagnosis. It happens that the gland is enlarged sometimes only in an anterior-posterior direction and when this is the condition the anteroposterior films will show no enlargement of the thymus though indirect evidence may be secured from the appearance of the lung fields produced apparently as a result of pressure from the thickened gland upon the trachea. It is well to note here that Parsons believes that the choking, in at least some cases, can be explained by a reflex condition produced by more or less edema in the smaller bronchioles. So that the clinician must be prepared to make a diagnosis of enlarged thymus gland in the absence of confirmatory x-ray evidence. Fortunately a therapeutic test may be made by radiation of the gland region with x-rays or gamma rays.

Thymus tissue because of its high lymphocyte content is so sensitive to irradiation that in practically all except moribund cases a prompt improvement in the condition of the patient will be observed if the enlarged thymus is the cause of the illness. Not every enlarged thymus produces untoward symptoms and it is barely possible that some other factor could be causative in such a case, but this is hardly probable at any time. If an adenitis is responsible instead of an enlarged thymus, irradiation can only be beneficial, although a favorable response will be much slower in coming about. Improvement in the condition of the

infant has been noted as early as eight hours after irradiation.

It has been the custom of the writer to give treatments with x-rays once a week or every two weeks until four treatments have been given. At every treatment an x-ray film is exposed to see how involution is going on. Check is kept on the symptoms at the same time. The technique used is: 5 ma., 8 inch spark gap, 10 inch target skin distance, 3 mm. Al. and about 2½ min. time. We believe that unless it is imperative to use heavy dosage because of the condition of the patient it is better to produce involution of any organ or suppress its function gradually than to do so in the quickest possible manner. Absorption of the broken down cellular elements is thereby spread out over a larger period of time and besides, it is a more nearly physiological process when involution is induced gradually. However, much heavier dosage can be employed when the seriousness of the condition demands and treatments can be applied posteriorly and anteriorly over the thymus region. With the milder treatments routinely used treatment is given only through the anterior chest wall, the rayed area being only that of the enlarged gland, special care being taken to avoid directly raying the thyroid gland region.

Radium has also been employed in these conditions but the writer has had no experience with its use.

That an enlarged thymus gland may continue to undergo involution for some time after x-ray treatments have been discontinued is shown in one case treated by the writer when an originally quite large thymus gland which had been reduced to a moderately enlarged size by four treatments at two week intervals proceeded to get smaller as was shown by x-ray films exposed three months and fourteen months after the last treatment was given. At the last examination the shadow of the thymus gland could not be distinguished. Treatments in this case were discontinued at the end of the fourth treatment even though the gland was still somewhat enlarged, because the child was apparently then well and because it was expected that atrophy would continue to take place. While no function for the thymus gland has been proved to exist, it seems best to the writer to use the smallest amount of radiation therapy that can be effectively employed.

Summary.

(1) The thymus gland is more frequently enlarged than is generally recognized.

(2) Harm is frequently brought about by the enlarged thymus, though not in every case.

(3) The thymus gland when enlarged laterally will as a rule show a characteristic shadow on the x-ray film. Enlargement anteroposteriorly only, however, does occur and a negative x-ray finding is not conclusive in the presence of positive clinical findings.

(4) Because of its histological structure, the thymus gland is peculiarly susceptible to either x-rays or gamma rays.

(5) Unless the case presents alarming symptoms, relatively mild x-ray dosage should be employed and repeated with the purpose of producing involution gradually. It does not appear to the writer that complete involution is necessary or advisable. Heavier dosage can be employed in cases demanding it.

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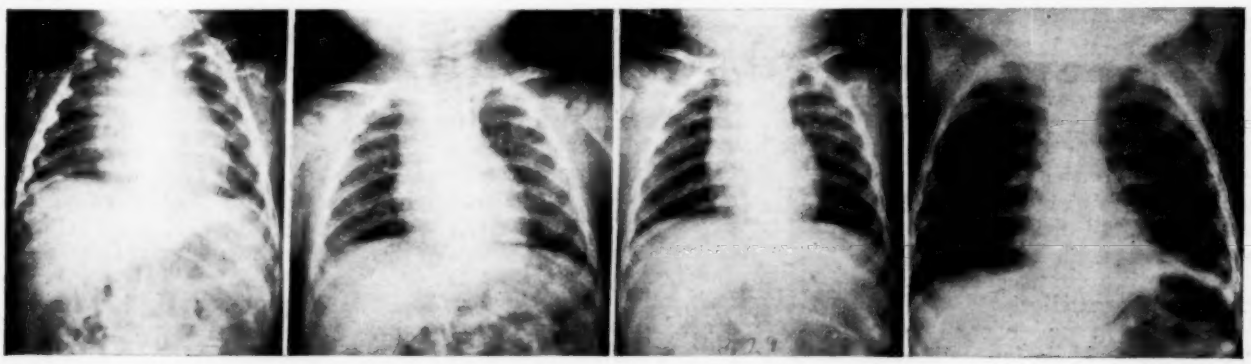

Fig. 4—Two weeks after Figure 3. Patient quite well. Shadow of thymus still shows considerable enlargement. Third x-ray treatment given.

Fig. 5—Taken two weeks after Figure 4. Patient apparently well. Thymus moderately enlarged although relatively smaller than it was eight weeks previously. Fourth and last x-ray treatment given.

Fig. 6—Taken three months after last x-ray treatment. Thymus moderately enlarged. Patient well.

Fig. 7—Taken fourteen months after last x-ray treatment. Unable to definitely make out an enlarged thymus. Patient continues to be well.

Pyorrhea and Other Pus Conditions*

FRANCIS A. GILLETT, M. D.

Oskaloosa, Ia.

WHAT few remarks I shall make on pyorrhea, will necessarily have to be taken from the case records of my associate, Dr. Roy C. Gillett, the dentist, to whom all oral cases are referred. I will consider pus conditions to mean those any place about the body. I cannot hope to give you anything very new from so short an experience as we have had with the actinic-ray treatments.

We have been using actinic-ray lamps since September, 1922, and have followed Dr. Plank's methods as closely as possible, but we have found it hard to find any set oral technique, and have developed a technique of our own, following the general principles of actinic-ray therapy outlined by Dr. Plank, Dr. Leir, and others. In treating oral conditions we have used the water cooled lamp, running it at 50 to 65 volts, using the form of localizer indicated by the part treated, starting in with one minute every other day and increasing the time fifteen seconds daily if not counterindicated by local irritation of the mucous membranes. We have found it hard to get above three minutes in treating the mucous membrane, except in tobacco chewers. With the end of the applicator one-half inch from the tissues we have continued these treatments until we have given 12, then we allow the patient to rest one week, thus giving a series of 12 treatments until the condition was improved or cured. These cases have fallen into two classes, those treated locally and generally.

As we are in the kindergarten, as it were, it would be impossible for me to give any final results of very many of our cases, as most of them are still being treated. In all cases of pyorrhea we find the actinic ray good. It relieves soreness and tightens the teeth, however, the first step in the treatment of all pyorrhea teeth is thorough scaling. In most all our cases of pyorrhea we resort to the surgical methods, anesthetizing the surrounding tissue, lacerating the gums and laying them back to get a thorough view of all the bony structure supporting the tooth, if necessary curetting the diseased bone away before the treatments are started.

One of the doctor's records is of a case of Vincent's stomatitis, or "trench mouth," treated by this method, in which the above technique was followed throughout. The patient was treated from Dec. 16, 1922, until Dec. 27, 1922, taking seven treatments in all. In the sixth treatment two minutes time was reached which caused a slight blistering, when we had to rest five days before going ahead with the treatments. We have observed this patient a number of times since and have found no trace of stomatitis. Local treatments were used in this case.

We find that actinic rays are very good in stopping pus formation around wisdom teeth which we wish to extract. In these cases we have been using three treatments in succession and by the fourth day the pus usually has been checked and extraction is not interfered with.

In cases where the patient has a mouth full of old snags and is rheumatic, general treatments for two weeks prior to the extraction of teeth has had a marked effect, both on the rapidity of healing of the mouth after extraction and the improved condition of the patient.

In patients who have abscessed conditions of the mouth with adenitis, we have used both local and general applications of the rays until the enlarged lymph nodes have receded and extraction of the offending tooth or teeth has been a safe procedure.

Now as to pus conditions about the body, our experience suggests first of all infected wounds and we think especially of the purulent granulating area that does not like to heal. We feel that there is nothing that has served us as well as ultraviolet rays applied locally in suppressing the flow of pus and hypergranulations, and in stimulating the growth of new epithelium.

We find these cases nearly every day in general practice and have kept accurate case records, and usually find recovery to be rapid. In all cases of infected wounds with lymphangitis, that we have treated, the process has responded readily, and in no case of infected wounds treated with the rays from the start has a lymphangitis developed as a complication.

In the treatment of abscesses and boils the rays shorten the time of slough formation, and when used early have aborted the condition, while the pain has always been relieved to some extent.

We have had a few cases of sinusitis following acute colds and these have responded to local applications of the rays to the nasal cavity, directing the ray upon the turbinates obstructing the drainage of the sinuses involved. It has only required two to six treatments in our cases, which have all been acute, to cure the patient. The rays contract the turbinal mucosa, which allows drainage, and the patient is relieved. The pain has been relieved after the first treatment. We have treated such patients daily getting up to five or six minutes time.

We have had one case of chronic ozena where purulent crusts were being discharged all the time from the nose, the patient having atrophic rhinitis with too much air space. In this patient local and general treatments were used over a three months period, treating three times a week steadily, in the nasal cavity getting the treatment time up to six minutes and up to fifteen minutes, generally running the air cooled lamp at first treatment for one minute, increasing the time one minute daily until fifteen minutes was reached and continuing at that, preceding it with fifteen minutes of 1500 watt radiant light treatment, as generally used.

The patient was discharged very much improved of her local trouble and generally feeling fine. I might add that in this patient we had a goiter of several years standing that has all disappeared, so the patient was naturally very well pleased.

We have used the rays as an adjunct to the treatment of Neisserian infection on a few cases, in both acute and chronic manifestations. We treated them locally and generally, using two to five minutes locally and the usual general treatment up to fifteen minutes as mentioned above. In all cases treated the sick-

*Read at Des Moines, Iowa, Feb. 28, 1924.

ness was shortened, and where the epydidymitis was very painful the patient has been greatly relieved.

Another case is a patient of 65 years, suffering from chronic adhesive vaginitis of several years duration, with a very acrid purulent discharge of a non-specific origin. Besides the discharge and attendant local excoriation the patient suffered no little amount of abdominal and back pain.

After dilatation and curettage this patient was treated with local and general rays for three months with almost entire relief of the condition.

Right here I wish to mention two conditions that heretofore brought unwelcome patients to our office, these are ivy poisoning and ringworm, but now I am glad to see such patients, for with from one to three applications of the ultraviolet rays they are easily cured.

In conclusion I wish to say that we have used our actinic-ray lamps constantly, trying never to use them unless absolutely indicated, and our results have been very gratifying.

The Treatment of Thyrotoxicosis by the Ultraviolet and X-Ray*

O. W. WYATT, M. D.

Manning, Iowa.

TO treat a diseased thyroid rationally we must know its physiological as well as its pathological function and then try to restore this dysfunction to normal if possible, looking through our armamentarium for the best means to accomplish this. I think you will agree with me that this is a rational procedure.

Physiology.

Although the thyroid gland weighs only about one ounce, it is estimated that, with a normal rapidity of the heart, all the blood of the body passes through the gland about once an hour. If the blood vessels of the thyroid are enlarged, or if the heart acts more rapidly, theoretically the blood of the body passes through the thyroid much more frequently than once an hour, and with a normal thyroid secretion the blood could take up more of it than is necessary for health.

The normal function of the thyroid promotes the normal skeletal growth of the child; while diminished function inhibits such growth. Good thyroid activity causes the growth and development of perfect teeth, both as to color and spacing. A child's brain does not develop well if the thyroid is insufficient.

One of the most important activities of the thyroid is its ability to prevent poisoning of the body, especially the poisoning that occurs from acute or chronic infection. If the thyroid is insufficient or becomes insufficient from such poisoning or irritation, life is endangered and the patient is benefited by the administration of iodine or thyroid extract. In thyroid insufficiency there is more or less of poisonous substances circulating in the blood. The seriousness of chronic infection, either of the mouth or tonsils, in causing, primarily, enlargement of the thyroid and, secondarily, insufficiency of the thyroid, should be recognized. On the other hand, such an infection often causes the thyroid to hypersecrete and Graves disease develops, hence a focal infection as the probable cause should be sought. If the thyroid undersecretes, the danger may not be recognized, but the patient is more likely to succumb to, or to be seriously affected by any acute disease that attacks him. With mouth infections and the streptococcus viridans as the infecting agent, it may be for a time difficult to tell whether the irritated thyroid or the germ is the cause of the cardiac symptoms. Both causes may be active at the same time.

An enlarged thyroid is frequently an evidence that that organ is trying to overcome a chronic toxemia. Therefore, many times when the thyroid is supposed to be at fault it is really doing its best to overcome some other condition that needs treatment. An individual who has survived many infections and serious conditions in all probability has a very normal thyroid. When the thyroid is hypersecreting it may cause serious cerebral disturbance by its ability to break down the phosphorized fats.

One of the chief functions of the thyroid is to take iodine from the blood and store it for its active substance, thyroxin. If the thyroid can not do this work, the pituitary may assume some of the thyroid's activity. In certain forms of thyroid insufficiency and in certain forms of enlargements of the thyroid, iodine or an iodide in small doses, may cause the gland to return to normal.

In endemic goiter there is likely to be a diminished amount of iodine in the thyroid and a retention of calcium in the body. In toxic goiter there is liable to be a large amount of iodine in the thyroid and calcium is rapidly lost from the body. In hyperthyroidism the blood is less coagulable, which may be due perhaps to the coincident extra loss of calcium from the body. There has been shown to be a greatly increased basal metabolism, even to plus 80 per cent in Grave's disease, and as low as minus 40 per cent in myxedema.

Chemistry.

One of the most interesting chemical studies of the body is the thyroid's need of iodine to render its secretion active. Kendall in 1914 first isolated the chemical substance which he termed thyrotoxin. It has been found possible to synthetize this most active substance. In 1915 Kendall described his two groups of thyroid proteins, Group A he named the acid insoluble compounds, Group B he named the acid soluble compounds. From Group A he isolated a pure crystalline substance or compound containing 50 per cent of iodine. Group B contains iodine in some unknown form of combination. It is a mixture containing amino acid complexes. Kendall, later, called this iodine crystalline extract "thyro-oxy-indol" or thyroxin, and this is the energy factor of the thyroid, and as he states, the generator of the rate with which we live. According to Plummer, normally, there is about 0.013 gm. of this energy stuff in the body, and each increase of 0.033 gm. of thryoxin in the body increases the energy output one per cent. Hence the energy of the body varies with the amount of thyroxin, and Grave's disease may increase this energy 100 per cent. Plummer states that thyroid secretion persists in the body for about eighteen days. The size of the thyroid gland is no clue to its activity, as has long been

*Read at Des Moines, Iowa, Feb. 27, 1924.

known, and large colloid deposits are more or less inert as far as furnishing energy or activity is concerned.

Kendall describes the physiological activity of thyroxin as follows: When injected subcutaneously into animals there is at first no effect on either the pulse rate or the blood-pressure, but after twenty-four to thirty-six hours the animal becomes restless, there is a slight increase in temperature, and a decided increase in pulse rate, and if several injections are given on successive days, these symptoms are all aggravated. He found that successive daily administration of thyroxin causes death, while a single injection of an enormous dose produces, in most instances, no effect. Therefore, he concludes that thyroxin in itself is not toxic, but toxic effects are caused by changes of this substance in the body when a dose is repeated and the thyroxin cannot be utilized. Kendall says the amount of thyroxin in the tissues is undoubtedly a physiologic constant, per weight of tissue as the normal number of red cells per cubic millimeter of blood. Marine and others have shown that the thyroid gland absorbs iodine from the blood; it may also absorb thyroxin. It would seem probable that while a certain amount of thyroxin is necessary to circulate in the blood to activate the tissues to a proper amount of energy, there must be some mechanism whereby that energy could be increased, if called for, by perhaps more thyroxin being produced, or by the removal of stored thyroxin. Seidell and Fenger have shown that in the winter months the thyroid glands of beef, sheep, and hogs all contain less iodine than during the summer months. To keep up the body temperature during the winter months the animals require more energy, and, hence, probably draw thyroxin from the thyroid gland, where perhaps it has been stored during the summer months.

Pathology.

The thyroid gland may be enlarged by hypertrophy, or enlarged by the increase of colloid; it may be cystic, adenomatous, and rarely cancerous; and it may be atrophied. That the thyroid gland is enlarged is no indication that it is hypersecreting, and on the other hand, it may hypersecrete and yet not be enlarged. Its activity may be increased to fight some infection, and later it may become enlarged on account of this increased activity.

While all disturbances of the thyroid gland were once considered very much more frequent in women than in men, and it was stated that 80 per cent of the cases occurred in women, at the present time this percentage is not true. Probably now 60 per cent of all cases occur in women and 40 per cent in men, although the more serious symptoms in both hyperthyroidism and hypothyroidism do occur in women in the majority of instances. Thyroid disturbances have become more frequent in men, due largely to mouth infections from crowns, bridges, and dead teeth. Possibly some of the thyroid disturbances in young men, are due to excessive athletics. A goodly number of the so-called neuro-circulatory asthenia cases, especially of drafted men, is due to hyperthyroidism. It is my belief that hyperthyroidism in the majority of cases is caused by infection in the mouth or adjacent sinuses.

Symptoms.

The symptoms of hyperthyroidism, which has been termed Grave's disease and Basedow's disease, and which Plummer well terms "thryotoxicosis" or poisoning by the thyroid, are as follows: Nervous irritability, insomnia, hot flashes, increased perspiration, which may be due to suprarenal action on the sympathetic system (the suprarenals are always disturbed and often enlarged in hypersecretion of the thyroid), tachycardia, tremors, loss of weight, exophthalmia, digestive disturbances which may be due to the disturbance which caused the thyroid trouble, that is various mouth infections, and later cardiac weakness. There may be hyperchlorhydria. Often these patients are too hot, and suffer from the heat in hot weather. There may be hypertension, which is probably due to coincident suprarenal or pituitary disturbance, although it is disputed that the suprarenal gland takes much part in the physiology of the blood pressure. These patients also may be subject to psychoses. They often have night sweats, diarrheal attacks or polyuria. Many of these symptoms may precede the actual hypersecretion symptoms. Enlarged thymus occurs in nearly half of these cases of Grave's disease, but it is doubtful if it increases the disturbance of the patient, and its secretion may inhibit the extra metabolism caused by the increase in thyroid activity. If the thymus is much enlarged its pressure on the trachea might be a cause of sudden death which sometimes occurs in thyroid operations. The pituitary, suprarenal, parathyroids, the pancreas, and the ovaries may be disturbed in hyperthyroidism. Some of these glands may have their secretion lessened, and some may have their secretion increased. Therefore, the composite symptoms which comprise the phenomena of Grave's disease are caused by the disturbance of many glands. There is increased irritability caused by increased loss of calcium, due perhaps to a disturbance of the parathyroids.

Tests.

Various tests have been suggested to conclude whether or not the thyroid is at fault in border line cases.

Goetsch Test: This test is made by injecting 0.5 c. c. of a 1 to 1000 solution of epinephrin into the deltoid muscle, which will tend to cause a rise in pulse rate and in blood pressure and an aggravation of all the symptoms in hyperthyroidism. Goetsch states that he has carried out this test in 300 cases of thyroidism and in 100 conditions simulating hyperthyroidism. His technique is to place the patient at rest in bed for at least a day before the injection in order to reduce nervous irritability and excitation, and cause the epinephrine hypersensibility to be more evident. Before injection two or three readings at five minute intervals are taken of the systolic and diastolic blood pressure and respiration. If these three readings are fairly constant, the epinephrine in the above dose is injected into the deltoid muscle. Then the pulse, blood pressure and respiration readings are made every two and one-half minutes for ten minutes, then every five minutes for one hour, then every ten minutes for one-half hour longer. At the end of one and a half hours, or less, the reaction has usually entirely passed off. Some reactions are noted in less than five minutes after injection of the epinephrine solution, and a positive reaction is evidenced by an early rise in the systolic and a fall in the diastolic blood pressure. If the reaction is very mild only the fall in the diastolic pressure may occur. "In the course of thirty or forty minutes there is a moderate fall in pulse and blood pressure then a secondary slight rise, then a second fall to normal in about one and one-half hours." During this time all the nervous symptoms complained of by the patient are increased in intensity. A normal person seems to show no, or at least very little, reaction to this injection. Also Goetsch says, that "in colloid goiter cases without symptoms of hyperthyroidism the reaction is negative." Conditions presenting some of the symptoms of thyroid disturbance

but without hyperthyroidism react negatively to this injection, and Goetsch states that the greater the amount of hyperthyroidism present the more positive and decided is the reaction.

The Harrower Test.

The patient is directed to take the pulse at 3, 6 and 9 o'clock and make a record on a pulse chart. The next day or the first day of the treatment the patient takes one-half grain of thyroid at 8, 10, 12, and 2 o'clock, recording the pulse at 9, 12, 3, 6, and 9 o'clock on the pulse chart. On the second day the patient takes one grain of thyroid at the same hours, and makes records as before. On the third day the patient takes two grains of thyroid at the same hours and records the pulse as before. On the fourth day the pulse is recorded as before, but no thyroid is taken. On the fifth day the pulse is recorded at 9, 12, 3, and 6 o'clock. The chart is then returned to the physician. If at any time during the treatment nervous irritability occurs, the treatment ceases and the patient reports to the physician, but the pulse record is still kept for the five days. These pulse charts are very interesting, and at the end of the five days you will be able to classify your cases as hypothyroidism and hyperthyroidism.

Basal Metabolism.

This is determined by calorimetric measurements of the respiratory exchange, namely the oxygen intake and the carbon dioxide output. Needless to state that such determination can only be made in a hospital or laboratory with an equipment for such scientific investigation.

Treatment of Thyrotoxicosis or Thyroid Poisoning.

As prevention is better than cure, it is necessary to carefully study all benign goiters, especially in women, who so often during the childbearing period have this gland normally disturbed. Hence all cases of enlargement of the thyroid gland should be sought and removed if possible. Also iodine treatment should be instituted, to ascertain if the colloid can be diminished and the gland reduced in size.

If all sources of infection have been removed, or none found, and if an iodide does not cause a benign goiter to become nearly normal in size, its surgical eradication should be considered. At the present time there is a strong feeling that in Grave's disease, in hyperthyroidism, and in thyrotoxicosis, operations on the thyroid gland have been too frequent, and that the medical or x-ray treatments are the safest, and generally offer the best future prognosis. Briefly, the treatment should be absolute rest, mental and physical. The diet should be milk and cereals, perhaps a few green vegetables, later, eggs and vegetable proteins. Meat in all forms, and tea and coffee should be prohibited. The patient should receive an extra amount of calcium, besides what is in the milk. To assist in the calcium metabolism fractional ultraviolet radiation should be employed, which appears to fix permanently the ionic calcium content of the blood serum. After a few treatments with the ultraviolet radiation the nervous irritability, tachycardia, and insomnia are less severe. The absorption of iodine also seems to be assisted by the use of the ultraviolet radiation. Plummer and his co-workers have shown that iodine in small doses will stop an extreme toxic condition, if it has not reached a morbid state, in from twenty-four to thirty-six hours. It also will bring down the metabolism to normal, and hold it there indefinitely. It is of no use in adenomatous goiter and may do harm by stimulating it to hypersecrete.

Out of 600 basal metabolism tests, none were made worse. In 100 there was marked benefit, in 150 definite benefit, in 150 slight benefit, one in twenty received no benefit, from the use of Lugol's solution. This marked percentage of improvement or benefit even seems to be improved by the addition of calcidine and the ultraviolet radiation.

In applying the air-cooled, ultraviolet radiation, it is desirable so to arrange the necessary factors of radiation intensity and spectral formula as to insure a maximum energy distribution in the region of the spectrum that operates best in calcium metabolism, which is between 2900 A. U. and 3022 A. U. This is accomplished by regulating the wattage so that the voltmeter reads 70. At this voltage, the region indicated is at its best. The clinical elimination of shorter ultraviolet wavelengths is gained by adopting a long distance between the tube and the skin, which should be 40 inches. Time of treatment, two minutes for the first radiation, increase two to three minutes at each subsequent treatment according to the tolerance of the patients, as the skin reaction should not be too severe, and should be carried to a point designated "stimulative erythema." As has been stated before, in hyperthyroidism there is also an involvement of one or more endocrine glands, and the ultraviolet irradiation due to its tonic effect on these glands tends to establish a balance in the secretion of these glands, thus neutralizing the secretion of the thyroid, to some extent.

Radical operations during an exacerbation of the symptoms seem generally inexcusable. On account of its action on the heart the danger is very great from this extra amount of secretion from the thyroid. If the heart does not quiet, and the symptoms do not abate with rest, the prognosis from thyroidectomy is not good. Also, the more lymphoid enlargement, as enlarged tonsils, and adenoids, and glands, the greater the danger from any operation, but some surgeons do not think it ever contraindicates an operation.

Before operative measures should be considered, it is well to try the roentgen ray treatment of the thyroid. The x-ray has been used in the treatment of Grave's disease since 1898. It was only with the advent of the Coolidge tube, however, that it became possible to control the dosage to an extent that enabled different workers to duplicate each other's results.

Pfahler presents evidence, based upon his own experience and that of careful workers in Europe and America, which has led him to the conclusion that roentgen therapy offers an equal chance with surgery for the cure of hyperthyroidism, and it is his opinion that "radiotherapy is the best form of treatment for toxic goiter." Our own experience leads us to the same conclusions. With x-ray treatments remissions may occur, just as with other methods of treatments. But that the secretion of the thyroid gland may be diminished by x-ray treatment is no longer questioned. Normal individuals in whom an erroneous diagnosis of hyperthyroidism has been made, have been rendered victims of hypothyroidism, with only a moderate dose, and even extremely toxic hyperthyroid individuals have developed hypothyroidism following repeated massive doses. The question then of successful treatment is one of correct dosage. The advantages of x-ray treatment of hyperthyroidism are as follows:

(1) Its freedom from danger. (2) There is no scar after operation. (3) Its ease of application with a minimum of inconvenience and loss of time to the patient. (4) It is painless and it is available in inoperable and postoperative cases. (5) If unsuccessful, an operation may be performed because of the

favorable action of the x-ray on the thymus gland.

Means and Aub believe that "the chance of a cure in exophthalmic goiter is as good with roentgen ray as with surgery, in groups of equal toxicity." They give preference to the x-ray method, since the danger of a fatal outcome is less, and they believe that surgery should be employed only after the roentgen ray and other methods have failed.

Method of Treatment.

Roentgen ray treatment is given over both lobes and the thymus area. Dosage: 200 kv., 50 cm. distance, 10 cm. port of entry, 1 mm. Cu plus 1 mm. Al, 15 min. Three successive doses are given at three week intervals. The basal metabolism is taken after the third treatment. If the rate is still high treatments should be given at monthly intervals for two or three times at the most, after the most careful consideration.

Summary.

(1) A careful history, preventive measures. In simple goiter, remove all sources of irritation, such as infections. Prescribe rest, iodine and calcium medication and ultraviolet radiation.

(2) Thyrotoxicosis or poisoning by the thyroid is due to an excessive amount of thyrotoxin absorbed into the body, the success of any treatment therefore, is proportional to its effect in suppressing this hypersecretion.

(3) The patient with thyrotoxicosis should first receive medication, ultraviolet radiation, and complete rest in bed.

(4) If this fails, the patient should receive roentgen ray treatment and have thyroidectomy only in case of failure to respond to this treatment.

(5) The general management of patients is of prime importance whether the ultimate treatment is to be roentgen ray or surgery.

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Medical Diathermy in Pneumonia of Children*

T. B. LACEY, M. D.

Glenwood, Iowa.

IT is with a great deal of hesitancy that the writer presents a paper upon the above mentioned topic. Owing to the fact that most of you are more experienced in this line of work, it seems to me that it is a good deal like the young son attempting to tell the old man something. Of course, in this day and age, such a thing is often done, but still, I do not think that it is the proper and correct thing to do.

About a year ago, this society was organized at Ottumwa, and the writer was honored by being asked to be present on that occasion. It was, to me, a revelation. Being an institutional physician I had tried to keep abreast of the times in the treatment of pneumonia, for this disease really is the most powerful agent in keeping up the yearly death rate. Hence, I was astonished to learn at that meeting how terribly far behind the times I was. I, like many others, thought of medical diathermy as a thing apart from present day ethics but after hearing the papers and talking with a number of the excellent men present at that meeting I decided that I was in a rut and that unless I put my chains on and commenced to climb I would soon be so far behind the main party that I never would catch up. Accordingly, upon my return to Glenwood I reported to my superintendent, Dr. George Mogridge, that I really thought that electrotherapy should be installed in order to give our population the most modern method of combating the different conditions that we meet. Permission for installation was granted from Dr. Mogridge and the Board of Control of State Institutions with the understanding that it was up to me to show that the money for the installation was wisely spent. I went to work in earnest, to learn for myself if all the claims put forth for diathermy were correct. My conclusions lead me to state that, in the main, all that I have heard in regard to diathermy is true.

Harking back a few years, most of you can recall the man, who used a small room in which were a number of electrical contraptions—violet colored bulbs placed under an open work chair and a few other peculiar things, which practice made that person a little open to criticism.

Today, such men as Stewart, Sampson and others have lifted up the former uncertain place of the electrotherapeutist to where he is looked upon as a true aid in the preservation of human economy, and in the relief of the present day physical ills.

As a newcomer, comparatively speaking, I have a few things to offer. There are a number of newcomers, and as time goes on, there will be many more such, and it seems to me that technique is one thing that should be worked out, so that we all may be better able to carry out our work. For instance, my work is entirely with children, and when my first case of pneumonia came along, I was unable to find a technique to use on these unfortunate little ones. One worker stated that I should use 1600 milliamperes, another used less and still another used more. About twenty minutes at the above mentioned milliamperage seemed to be the right time. However, all were agreed that the electrodes were to be placed over the pneumonic area.

Under the present series, I have used all of the present day methods of diagnosis but typing the cases. I could not accomplish this as we have no laboratory man. Consultation has been had with a physician who, until last month, has been quite opposed

*Read at Des Moines Feb. 26, 1924.

to diathermy. X-ray films were made after the diagnosis, to corroborate it. Thereafter an x-ray film has been made each day. This daily procedure has been made at the same time each day with the same setting. In this maner we have been able to check up the daily changes occurring in the lung, while the patient has received two treatments of diathermy daily.

In some of these cases, treatment has been started on the first day of the disease, and some cases have received no diathermy until the fourth day. There are two cases in the category last mentioned. The delay was caused by lack of agreement in the diagnosis. As soon as the diagnosis was agreed upon and confirmed by consultation the diathermic treatment was started.

Medication was practically neglected in all of the cases. In two cases a two grain dose of a quinine preparation was given every four hours. This was given mainly as a relief to those about the case. I can therefore state that medication has played no part in the recovery or non-recovery of the cases.

I can readily understand that in some places where diathermy is yet frowned upon by the internist that you will have some difficulty unless you have a portable apparatus, as the internist will not consent to have his patient moved from the room to the electrotherapeutic department twice a day. However, I insist that as long as the patient is carrying a degree of temperature, he shall receive two treatments each day at balanced intervals. The first of the daily series, with the accompanying x-ray commences about 10:00 o'clock each morning and the second of the daily series commences at 7:00 o'clock each evening. I prefer to make the second of the series as near the usual bedtime of the patient as possible, because after completing the treatment that patient is in a good mood to seek a night's rest.

In the treatment, I time each minute by an interval timer. I start with zero for the first minute and increase each minute with 100 milliamperes until there is complaint from the patient. So far, I use 200 milliamperes for each year of age of the patient. Several patients have been four years of age and I have found that about 800 milliamperes of current is the maximum that the child will take without complaint. Let me state that I do not consider this a hard and fast rule. I realize that all children are not alike in regard to skin reactions. As a rule the maximum dosage has not been assumed at the first treatment. The hum of the converter, for we use direct current, the noise of the gap and the usual child's fear play a part in not securing the proper dosage. However, after the first treatment, when the child feels that no harm will come to it, and when we have secured his confidence, we are able to secure better results. One boy six years of age, with bronchopneumonia, offered no improvement until we gave him 1200 milliamperes. On the other hand an infant eight months of age gave us plenty of thought when we gave him 200 milliamperes. As stated above, we advance 100 milliamperes each minute until the maximum dosage for the patient has been reached. Here we continue for ten and not longer than fifteen minutes. We find that the treatment prolonged beyond that time renders the child impatient and restless, and it seeks to get away from the now tiresome feature. In backing down from the maximum dosage, I am very insistent that, unless there is some cause, the retirement, shall be at the same rate as the progression, that is, 100 milliamperes each minute.

During the treatment, the patient is kept well covered, and a nurse is instructed to see that the patient is comforted, and talked to if too restless. After treatment when the patient has been returned to his bed we encourage him to drink freely of milk or water, as a maximum liquid intake is beneficial.

During the treatment the patient is watched carefully for favorable or unfavorable signs. Usually at about 500 milliamperes we find the patient with a glow upon each cheek and upon the ears, and shortly after, sometimes, we find marked perspiration over the forehead, more marked at the hair line, the eyes seem brighter and the patient seems relieved by the treatment. We have had one patient who, when we have reached 200 milliamperes developed marked hiccoughing which seemed rather persistent. The treatment was continued and in due time the hiccoughs ceased. This same patient had a sudden drop in blood pressure shortly after his seventh treatment, which necessitated the use of hypodermic injections of caffeine and sodium benzoate. The temperature immediately preceding the treatment was 101.4, pulse 88, and respiration 26, with a fair physical condition. A short time after the diathermy treatment his temperature dropped to 96, pulse 60 and of poor quality, respiration of 16. Needless to say diathermy was not repeated in this case. The boy made a complete recovery. However, I feel that if he had not had diathermy he would not have been living today.

Regarding end complications, I have noticed a purulent otorrhea in only two cases. This symptom occurred about one week after the patient's temperature became normal.

In handling these cases in the department, we use a card devised by ourselves, to which we can turn, at any time and determine the amount of the current used on any patient. Symbols are used for each minute of 100 milliamperes for the purpose of conserving space. In explanation of these cards I will state that A equals one minute of 100 milliamperes, B equals one minute of 200 milliamperes, C equals one minute of 300 milliamperes and so on. You will notice that all periods are one minute unless otherwise stated by a figure before the letter. A final maximum might read 15 E which would indicate that the maximum dose was 500 milliamperes and that this was continued for a period of fifteen minutes.

In conclusion, let me state that I do believe that diathermy does simplify the treatment of pneumonia; that it seems to offer a safer carriage through the paths of this disease; that it is far more acceptable to children than the dosage with various drugs; that it shortens the convalescence and that it seems to be the safest and best method of handling pneumonia so far brought forth.

We do not think tnat diathermy immediately stops the progression of the disease. In one case it was noticed that treatment was started before all of one lobe was involved. In spite of treatment the involvement continued until the entire lobe was pneumonic, and then the reparative process began. It does not cause an immediate absorbtive process. This is rarely seen before the fifth or sixth treatment. It does not cause an immediate drop in temperature. Usually we have a drop on the second day, with a rise on the third day, after which the temperature gradually lessens.

We have had two deaths out of eight cases in the last two months. The first death was that of a little girl who was brought into the hospital at 3:00 p. m., and died at 10:00 p. m. the same day. We succeeded in giving her one treatment but it was plainly evident that nothing could save her. I feel that in this case diathermy did not have a

chance. In the second case, the child made a complete recovery from pneumonia, which was of the lobar form. Her temperature had been normal for a week when she suddenly passed away. The final diagnosis in this case was a pulmonary embolus.

We feel extremely grateful to diathermy in our cases, from the fact that it was stated positively, by the consultant, that the children would die because of the seriousness of the cases, the lack of medication, and the types of children having the pneumonia.

In closing this paper, I cannot but feel that all we have accomplished along the lines of electrotherapy would not have occurred had not I had the pleasure of attending the meeting of last year. I am sure that this meeting will bring a great deal of good to all of us, not only that, but I am sure that the physician back home will also be benefited. In this paper I spoke of a consultant who was opposed to the use of diathermy. Last year he ridiculed the writer for listening to the sweet words of salesmen and others; let me say that this consultant called me a couple of days ago, asking that I look over the exhibits here and let him know just what portable outfit he had better purchase, as he was sure he needed one for his practice.

EDITORIAL

The JOURNAL OF RADIOLOGY

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A. F. TYLER, M. D.,
Managing Editor

ANNUAL MEETING

American College of Radiology and Physiotherapy

Chicago

November 10, 11, 12, 13, 14.

Hotel Sherman

Program.

The program of the annual meeting of the American College of Radiology and Physiotherapy will be interesting, instructive, and varied. All phases of physical therapy and radiology will be covered by authoratative authors. The following brief outline indicates the various subjects it is hoped to present:

Diathermia—Medical and Surgical.
Galvanism.
Faradism.
Sinusoidal Currents.
X-Ray Diagnosis.
X-Ray Therapy—Superficial and Deep.
Radium Therapy.
Quartz Lamp Therapy.
Radiant Heat.
Infra Red Therapy.
Massage.
Hydrotherapy.
Occupational Therapy.
Physical Aspects of the Various Subjects Mentioned Above.

The program will be made up of papers and clinics.

It is the desire of the program committee to have the various subjects presented by men employing the various methods in their practice as well as by teachers and research workers. You are cordially invited to send in title for any papers you wish to present. The program is now being built so that immediate action on your part will be greatly appreciated. Send all titles and other communications regarding the program to

DR. R. W. FOUTS, Secretary.
121 So. 33rd St.
Omaha, Nebraska.

Radiological Society of North America.

THE midyear meeting which was held in Chicago, June 6th and 7th, was the best attended summer meeting in the history of the organization. Chicago is so centrally located and easy of access to so large a medical population that more than 300 registered. The program was interesting and varied, covering the various phases of roentgen ray diagnosis, roentgen ray and radium therapy, and the physics of roentgen rays.

Among the most interesting papers presented was one upon adamantine epitheliomata by Dr. John T. Murphy of Toledo. He discussed the embroyological development of the jaw and tooth-forming organs, showing the epithelial origin of adamantinomas and also the pathology of a very extensive case located in the maxilla, in which the tumor was removed by the high frequency cautery with good results. This paper emphasizes the importance to the radiologist of a knowledge of tumors of the jaw, a point which the Journal of Radiology has been stressing for some time as evidenced by the articles by Doctor Lurie and Doctor Shearer.

Maude Slye, Ph. D., read a paper entiled, "Some Aspects of Future Preventive Medicine on the Basis of the Facts of Heredity." The work of Doctor Slye on the heredity of cancer stands monumental today and is, so far, undisputed by anyone who really knows anything about spontaneous cancers. Comment on her paper is unnecessary, so clear cut is her presentation and so thorough her work. May she live long to contribute still more to our knowledge of cancer.

Dr. L. R. Sante of St. Louis reported observations made on 12 cases of miliary tuberculosis. He concludes that there is evidence of an acute and chronic form, the latter ending in healing by calcification. He feels justified in thinking that miliary tuberculosis does not always end fatally as is generally conceded by the appellation, "galloping consumption." Doctor Sante deserves great credit for his persistent and enlightening studies of diseases of the lungs.

Dr. Evarts A. Graham of St. Louis showed lantern slides of the gall-bladder of patients who had received intravenous injections of tetrabromphenolphthalein. When proper technique is employed the method is unaccompanied by evidence of toxic effects and the gall-bladder is readily demonstrable. Doctor Graham feels certain at this time as to the correct interpretation of the changes in the gall-bladder image revealed by this method and seeks a wider use of it in order that general deductions may be made. At the time the paper was read he had employed the method in 54 patients.

The technique suggested by Doctor Graham is as follows: (1) Colon emptied by cleansing enema until water returns clear. (2) Patient must fast twenty-four hours following the injection, only water being allowed

by mouth. (3) Dissolve 5 grams of sterile tetrabromphenolphthlein, in 40 c. c. of sterile distilled water and inject into the vein. (4) Patient should be hospitalized and when in bed should lie on the right side. The upright position in a chair, or the standing position, is permissible. (5) Roentgen ray films of the gall-bladder region should be made at 4, 12 and 24 hours after the injection of the solution.

The Doctor emphasized the necessity of securing the chemical in 5 gram hermetically sealed ampules because of toxic effects which follow the use of the chemical when it has been exposed to oxidation in larger bottles.

Dr. Amedee Granger of New Orleans showed a device by which it is possible to make roentgen ray films of the mastoid symmetrically and always at the same angle. Both mastoids can be imaged on a single 8 by 10 film in both the Law and Arcelin positions. The device consists of two 13 degree angle boards, one placed on top of the other. On the side of the upper one is an upright against which the nose rests in the Law position, or the side of the head rests in the Arcelin position.

Dr. Lewis Gregory Cole, the pioneer in roentgen ray diagnosis of diseases of the stomach and duodenum drew repeated applause from the audience during the showing of original moving pictures of the stomach and duodenum. Not only were the pictures perfect from the photographic standpoint but they were instructive from the physiological and pathological standpoint.

The American Radium Society.

THE ninth annual meeting of the American Radium Society was held in Chicago June 9th and 10th with President James T. Case presiding. Seventy-four papers were presented during the two-day meeting besides four addresses the evening of the banquet. This two-day meeting combined with the two-day meeting of the Radiological Society and the two sessions in radiology at the meeting of the American Medical Association probably occupied more time on the subject of radiology than was occupied by any other phase of medecine.

Prof. C. Reguad of the Curie Foundation of Paris was the foreign guest of the Society. He said that the purpose of his visit was to observe the work being done in America and other countries in order that he might better direct the work of the Curie Foundation. He presented two addresses, the one entitled, "Biological Aspects of Radium Therapy" and the other, "Clinical Results of Radiation Treatment."

Among the other papers presented at the meeting, "The Treatment of Fibromas of the Nasopharynx" by Dr. Gordon B. New and Dr. F. A. Gigi, Mayo Clinic, was interesting and helpful. Thirty-two cases were reported covering a period of 14 years. The authors' conclusions are that radium is the treatment of choice for fibromas of the nasopharynx. Radium eliminates the mortality associated with the surgical treatment of these growths; in most cases it entirely clears up the growth and in the others the condition is held in check during the activity of the tumor until spontaneous regression takes place.

Dr. G. W. Grier, Pittsburg, read a paper entitled, "The Treatment of Malignant Disease in the Mouth." He emphasized the necessity of careful technique and said that topical applications were preferable to implantations if the lesion could be fully exposed that way. He emphasized the value of treating the cervical glands in all cases, preferably before the primary lesion is treated.

Dr. C. Augustus Simpson, Washington, D. C., read a paper entitled, "Radium in the Treatment of Tonsils." He called attention to the fact that he was not uttering a criticism of the surgical removal of tonsils but rather explaining a nonsurgical treatment whereby the tonsil can be atrophied and its fossa really cleared of lymphatic tissue.

Radium treatment by the oral plaque or emanation seeds is indicated in patients who have recurrences or tufts of lymphatic tissue in the fossa after an operation. Radium treatment is indicated in hemophilia, tuberculosis, grave cardiovascular disease, hypertension, Bright's disease or any other physical or psychic condition making surgery inadvisable.

When emanation seeds are used they should not contain more than 0.5 mc. and should be placed 0.5 to 0.75 cm. from the pilliar.

Dr. Hugh H. Young, Baltimore, gave a "Survey of Results Obtained with Radium in Carcinoma of the Prostate and Bladder. Dr. Howard Kelley, Baltimore, spoke upon the subject, "That Which is Assured in Radium Therapy."

A New Clinic In Boston.

DR. Isaac Gerber of Providence, R. I., has received an unusual honor from the trustees of the Boston City Hospital. He has recently been appointed as assistant in the x-ray department of that institution and is to have charge of a new sub-department of Radiation Therapy. This department is to be newly equipped and reorganized and will have quarters in the recently dedicated Thorndike Memorial Laboratory. Here all types of x-ray treatment will be employed including both superficial and deep radiation. All the radium treatment of the hospital will be admisistered through this department. Not only will the usual radium salts be utilized but in addition there will be provision for the use of radium emanations wherever indicated. Opportunities will also be available for the use of electro-dessication and electrocoagulation, which have been found of extreme value as adjuncts to the other methods of radiation treatment. This is the first clinic in New England where these electrothermic methods will be used to any extent. Besides it will be the first hospital department in New England in which all the methods of radiation treatment will be used in combination and under the direction of a radiologist.

From the Rhode Island Medical Journal, May 1924.

ABSTRACTS and REVIEWS

The Preliminary and After Treatment in X-Ray Therapy. H. WINTZ, M. D., Ph. D., Journal of Cancer, 1:22-47, January, 1924.

PRELIMINARY treatment should be begun with the radiologist explaining to the referring physician (if this is necessary and it often is), the ways and means and probable duration of treatment. The referring physician should then make the patient acquainted with what may be expected. This should be made clear to the patient who should not have hospitalization or the energetic measures of treatment come as a surprise. On the other hand the over anxious patient must have his or her fears allayed in so far as they are unjustified.

Correct diagnosis is absolutely requisite before radiation is given. Secondly, proper preparation for actual treatment must be carried out. This of course varies with the type of lesion and often requires very careful clinical and physical diagnosis being made before any other preparatory measures are taken, and in every case the patient's general health should be carefully looked into before treatment is instituted.

After Treatment: This must be even more carefully handled than the preliminary treatment and there are four factors entering in, namely: (1) Rectification of injuries caused by the x-rays, more or less noticeable even in healthy tissues, and which can be alluded to as both local and general; (2) Elimination of decayed products from disintegrating tumor cells and paralyzing or harmful products of metabolism of the normal cells; (3) Assistance rendered the body for lasting resistance against carcinoma; (4) Thorough restoration of healthy tissue in place of the malignant growth.

Hot water bottles, electrically heated pads or the use of radiant heat, also icepackings, are prohibited after x-ray treatment. Chemical influence of ointments is also to be guarded against and pressure from clothing is another thing that the patient must be warned about. For a pure *unguentum leniens* the author recommends the following:

Rp.

Cerac alb	2.1
Cetacei	2.4
Ol. oliv.	18.0
Aq. dest.	7.5

This is to be used regularly for three or four months after the x-ray treatment. It may be washed off with soothing soap from time to time.

Irritation of the bladder or a changed chemical composition of the urine can produce harmful complications. Sometimes, though rarely, incrustation of the bladder occurs after x-ray therapy. If a patient has been treated in the neighborhood of the bladder she should be recommended to drink water very freely and frequently. The bladder should be emptied before each application of x-rays and every hour during treatment. Conditions of irritation do not usually appear if proper technique has been employed.

Harmful effects on the rectum are of more significance. Very particular attention must be paid to the bowel action, especially after treatment for carcinoma of either the uterus or the rectum. Injections and instillations of oil are recommended. Many patients find it easier to use suppositories of paraffin or olive oil. These should be used for two months after treatment. To procure easy action of the bowels the author recommends, three times per day:

Rp:

Magn. perhydr. (Merck)	30.0
Sodal bic.	20.0
Pulv. rhei rhiz.	15.0
Bismuth subnitr.	7.0
Carbo. anm. (Merck)	3.0

Inflammatory changes of the mucous membrane of the mouth, pharynx or laryngeal mucous membranes must be kept in mind as a possible danger and the patient warned that neither very hot nor very cold foods be partaken.

Every active treatment of indurated edema is to be shunned. Serious phlegmon or decay of tissue may result from incision of such an indurated region.

Induration of the lung tissue occurs after systematic treatment of carcinoma of the breast. It is generally harmless and requires no active after-treatment but cognizance of it is important.

General harmful effects are of all degrees. The electric charges generated during x-ray treatment of the body cause a toxic effect which furnishes the origin of x-ray sickness. It should not be unknown that x-ray sickness in some patients is due to psychic effects. The severity of the x-ray sickness seems to depend considerably upon the locality treated. The toxic effect of the nitrous acids in the air and of the ozone and ozone compounds also plays a large part in producing x-ray sickness. Rapid cell decay also plays a large part.

The author has tried different remedies and has found that a carefully conducted scopolaminpantopon "twilight sleep" is worthy of consideration in many cases but is not permissible with every one. Earthing seems to help but is useless for some cases, e. g., where short distances or compressor irradiations are given. Twenty-five drops of anesthesin to a small glass of heavy red wine helps sometimes, also the inhalation of menthol. It is most important that the bowel movements should be free for several days before treatment. Ordinary salt or mormosal by suitable drop infusions will be found useful in that the nausea, headache and distaste for food rarely persists longer than three weeks if such measures are employed after x-ray treatment. Long train journeys after treatment seem to produce a very obstinate form of x-ray sickness.

Harmful effects on the blood have an important place in the general damage done and they are generally directly dependent upon the x-rays absorbed by the body.

The noticeable blood changes are typical to a certain extent. There is a diminution of the quantity of hemoglobin, of leukocytes, or lymphocytes, and the coagulation is altered. These changes are temporary, however, and in nearly every case the blood returns to its original condition within six weeks. Among the author's patients not one has succumbed to an acute blood decay. Nevertheless the control of the blood should be carried out in all cases.

When the malignant growth has been destroyed by the rays the body must then eliminate the products of decay and set recuperative processes in motion. Therefore care must be taken to see that as far as possible the work of the body be lightened that it may devote all its energy to this task. Cachetic bodies often fail under this strain, which explains

many a failure even though distant metastases are not found. The patient must be impressed with the fact that the x-ray treatment is only the begining of the treatment and that general living conditions, a general dietetic treatment, open air, rest and all possible care are necessary to cure. Of course, circumstances may not permit this care in all cases but wherever economic conditions permit it must be carried out.

Tonics may be given. Preparations of iron and arsenic have been found efficacious. The ferruginous elarson used by the author is a tablet composed of one-half milligram arsenic and 30 mg. iron. The patient is given three tablets daily the first five days, four tablets daily the next five days, five tablets daily the next five days and so on up to fifteen tablets daily for five days if the patient can stand that many. At the end of treatment the patient will have had 32.85 g. of iron and 0.5475 g. arsenic. Not all patients can be given the arsenous iron internally and the author generally prefers injections of arsacetin, using a five per cent solution either subcutaneously or intramuscularly in the following quantities:

1st week, daily, 1 c. c.
2nd week, daily, 2 c. c.
3rd week, daily, 3 c. c.
4th week, every *alternate* day, 4 c. c.
5th week, daily, 3 c. c.
6th week, daily, 2 c. c.
7th week, daily, 1 c. c.

No harmful effects have ever been noted using these quantities thus. If it is found that a patient cannot tolerate arsacetin then some other arsenous preparation should be tried; solarson has been used with good results.

Such precautions as rinsings of permanganate of potash or hydrogen superoxide in ichorous decaying carcinoma of the uterus should be observed. Cauterizing or test excisions are condemned. Every irritation to the malignant tissue should be avoided, hence the need of surgical aid in carcinoma of the rectum (colostomy), in esophageal lesions, etc.

A satisfactory end-result depends very largely upon well conducted after treatment. This must be kept in mind.

Deep X-Ray Therapy: Some Encouraging Results. W. PILGER, M. D. The Journal of Cancer, 1:9-21, January, 1924.

DOCTOR PILGER presents more than 25 case reports including cases of epithelioma, uterine cancer, cancer of the intestinal tract, breast, prostate, branchial cancer, cancer of the tonsils and of the tongue, various sarcomas, tuberculosis of the bladder, of the cervical glands, and one case of lupus vulgaris. All these were treated by deep x-ray therapy and with success in nearly every case.

Roentgen Ray Cachexia. CHARLES L. MARTIN, M. D., and FRED T. ROGERS, Ph. D., Am. J. Roentgenol. 11:280-286, March, 1924.

A LARGE dose of x-rays delivered to the entire abdomen of a dog was found to produce rapid death within a few days after exposure. Smaller doses of x-rays delivered directly to a single isolated loop of the small intestine of a dog produced a slowly progressive cachexia. The animal may die in about two months during the stage of intestinal ulceration or may die in five or six months from partial intestinal obstruction. It was found that fat absorption was inhibited when heavy doses of x-rays reached the smaller intestine.

The Effects of the Shorter Wave Length Roentgen Ray on the Gastric Secretion of Dogs. SIDNEY A. PORTIS, M. D., and ROBERT ARENS, M. D., Am. J. Roentgenol. 11:272-279, March, 1924.

THE human dosage of the shorter wave length roentgen ray therapy, when applied over the chest of a dog, has little or no effect, except a transient stimulation of the gastric secretion. Gastric acidity is markedly lowered when the exposure is over the lower abdomen, below the stomach, and when the stomach itself is exposed achylia or near achylia is produced. More damage will probably be done to human gastric glands, using the same dosage and the same technique than was done to these animals.

The Treatment of Cancer: A Medical Rather Than a Physical Problem. H. J. ULLMAN, M. D., Am. J. Roentgenol, 11:256-258, March, 1924.

PRESENT day evidence is in favor of the following hypotheses: Tumor cells are not killed in the ordinary sense by radiation and to obtain a cure a quantity and quality of radiation must be given that will be detrimental to the tumor but will not break down the body defenses. A proper dosage will stimulate rather than lessen bodily resistance or reaction in addition to injuring the tumor cells. Heavy radiation renders the body as a whole more susceptible to tumor growth but light radiation makes it more resistant. The proper or optimum radiation in any given instance depends on the host's ability to react in the desired manner as well as upon the type of tumor cell under consideration.

The treatment that will give the patient the most comfortable existence for the longest period of time is the one that should be sought in every case.

The Metabolic Changes Associated With X-Ray and Radium Treatment. E. C. DODDS, M. B., and J. H. DOUGLAS WEBSTER, M. D., The Lancet, 206:533-536, March 15, 1924.

IN the editorial column of the same issue of the *Lancet* the editor has this to say of this paper by Drs. Dodds and Webster: "The machinery of two scientific departments at the Middlesex Hospital was set going to determine the essential biochemical changes involved in radiation toxemia, or x-ray sickness as it has graphically been called. The aim of the research was to determine by a study of basal metabolism, what are the characteristic changes in radiation toxemia, in order to bring these changes into relation with other comparatively well known toxemias such as those occurring during anesthesia, in the course of diabetes, as a result of fevers, migraine, uremia and the like. A primary difficulty in this investigation, which was carried out entirely upon the human subject, was to appraise correctly the three factors necessarily complicating the results—namely, the disease in question, the effect of treatment on the disease, and finally the effect of the rays on the patient's metabolism. Four clinical groups of disease were investigated, the patients being in bed and maintained on a constant diet, while the urine collected in 24 hour specimens was analyzed for urea, uric acid, ammonia, acidity, total nitrogen, ammonia coefficient, phosphates, chlorides, creatinin and diastase. The results of all these clinical findings coincided in a remarkable degree with those obtained experimentally in animals by the American observers. The changes in metabolism closely similar whether x- or gamma rays were employed, were found to vary essentially with the site radiated. Radiation of head thorax or limbs produced no appreciable change in metabolism. Radiation of the cervical region produced no change other than an immediate fall in the urinary creatinin, attributed

by the authors to temporary paralysis of the parathyroids. On the other hand radiation of the abdomen and spleen produced definite urinary and blood changes which are set out in tabular form in the authors' article. The metabolic changes can be best explained by a temporary inhibition of the functions of the three principal abdominal glands—namely, the liver, pancreas, and kidneys—the fall in urea content of the blood being outside the picture. The figures give no support to the theory of acute uremia recently enunciated by Anderson and Kohlmann, which was the starting point of the authors' investigation; but they do give some support to Lange's theory of acidosis, in view of the fact that the ammonia coefficient definitely rises as a result of radiation.

"In the light of metabolic changes which they observed, Dr. Dodds and Dr. Webster suggest the possibility of prophylactic measures, which are to form the basis of a further investigation. Administration of calcium chloride or sodium bicarbonate before radiation has already in some cases resulted in the diminution of the ensuing reaction."

The editor remarks that this scholarly contribution should pave the way for later workers.

The Physiologic Action of Ionizing Radiations. ALFRED C. REDFIELD and ELIZABETH M. BRIGHT, Laboratories of Physiology, Harvard Medical School. Am. J. Physiol. 68:53-61, March, 1924.

THE author's abstract reads thus: (1) "A theory is developed which assumes that some constituent of protoplasm is ionized at a constant rate proportional to the intensity of beta radiation. The ions so found may either recombine or lose their ability to do so by entering into combination with some other constituent. The number having the latter fate determines the value of the velocity coefficient of the reaction. * * * (2) Experiment supports the theory in indicating that temperature may influence the velocity of the process by altering the number of ions which recombine without contributing to the physiological change. (3) The Bunson-Roscoe law may be regarded as a special case of the theory. Certain lots of (Nereis), eggs conform to it in their response to beta radiation.

Hereditary Structural Defects in the Descendants of Mice Exposed to Roentgen Ray Irradiation. H. G. BAGG and C. C. LITTLE, Cornell Uni. Med. College and Uni. of Maine. Am. J. Anatomy 33:119-138, March, 1924.

ABNORMAL eyed animals were found in the third and subsequent generations of the descendants of a group of mice treated on five consecutive days with comparatively light doses of unfiltered roentgen rays. From animals thus treated, two matings, each of a separate and different male and female produced very similar types of abnormality both morphologically and genetically.

The eye abnormality exhibited a wide range of variation from a slightly perceptible defect in one eye to nearly complete atrophy of both eyes. The defect is associated with marked optic atrophy and a deformity of the skull on the same side of the head as the defective eye. In a few cases the ear adjacent to the abnormal eye showed a marked reduction in size. Club feet appeared in many of these animals. From an examination of the animals in embryo it was concluded that there was some relation between a defective blood vascular system in the embryos and a later arrested development.

Treatments were planned so as not to affect the health of the animals nor prevent them from breeding. The technique was: Target skin distance 12 inches, 2½ inches spark gap, 10 ma., no filter, time was 12 sec. on each of five successive days. The mice were confined to a small space and the entire dorsal surface irradiated.

Radium in Medicine. C. J. BROEMAN, *M. D.*, Ohio State M. J. 20: 226-230, April, 1924.

IN all probability the most valuable influence of radium at present is to be noted in the amelioration or cure of conditions generally termed incurable.

One of the strongest arguments in favor of radium therapy is the fact that its rays show a selective action on different types of cells, and while all tissue cells are susceptible to its influence, the neoplastic, abnormal or pathologic cells are noticeably altered or destroyed, while the surrounding healthy cells resist the influence of these rays.

This selective action of radium is often lost sight of by the physician. Some are not willing even to admit the fact, but what better example can be given to illustrate the fact than the remarkable way a large cavernous nevus will disappear when radium is properly applied? In some cases not even a scar remains to show where the original abnormality was located. This result is not attained by any other form of radiation, including the x-ray, which, to the author's mind, proves that the rays given off by the radium are in some respects, at least, entirely different in action that the x-rays which, for instance, do not materially influence nevi.

The original article contains reports of cases of splenomedullary leukemia which were treated with radium and are living today, although not cured they are well enough to continue their regular occupation. In these cases a large quantity of radium was applied directly over the spleen for from 15 to 20 hours. One such application with 350 mg. radium, one and one-quarter inches distant, usually reduced the white cell count from 90,000 to 30,000. The spleen also becomes smaller with such an application. A typical example is given of such a case.

The writer also calls attention to the fact that in generalized lymphosarcoma, radium causes the individual nodules to disappear as well as the pain that is so often associated with their presence. It is reasonable to assume that if the primary lesion in this disease could be treated thoroughly with radium in its beginning, this incurable disease might be prevented from reaching its usual fatal ending.

The writer also reports six cases of Hodgkin's disease in which five cases yielded a favorable result from radium treatment, the sixth patient was not traced. The results obtained in this disease were all the more remarkable as a number of the patients were of advanced age. The writer is of the opinion that no patient having Hodgkin's disease need die of it (providing the diagnosis is made early before the entire glandular system has become involved), if radium is applied properly in large enough quantities.

In conclusion the author urges that the value of radium be recognized as a powerful therapeutic agent and that its tremendous possibilities be given their merited attention. Every effort should be exerted toward the improvement of technique, one's best powers of discrimination should be applied to its application and the same diligent perseverance should be maintained that in the past has been maintained in surgery and other forms of therapy.

A Comparative Study of Normal and Malignant Tissues Grown in Artificial Culture. A. H. DREW, D.

Sc. Brit. J. Radiol, 29:43-57, February, 1924.

CONTINUED growth of normal and tumor cells in vitro is only obtained in the presence of substances so far only found in embryonic extracts. A salt mixture in which the calcium is present in the colloidal state can, with the addition of embryo extract, replace plasma for this work. The degree of differentiation shown by cultures of normal and malignant tissues is partly conditioned by the accompanying growth of the stroma. The stroma behaves in culture like embryonic tissue rather than like the adult tissues from which it is derived.

What Progress is Being Made in the Treatment of Cancer? BYRON B. DAVIS, M. D., F. A. C. S., Illinois M. J. 45:184-189, March, 1924.

IN cancer of the tongue removal of the local lesion by the cautery or radium is replacing the knife. In all these cases the radical removal of the cervical glands by block dissection as practiced by Crile seems to be rational and in accord with the methods found useful elsewhere.

In cancer of the lip "prophylaxis and operation on the cases while localized will be followed by a large percentage of cures."

In cancer of the breast the author, while he has used x-ray postoperatively in most cases, is not convinced that roentgen treatment adds to the chance of recovery and in some cases it has seemed to be detrimental. Much careful research is required before an authoritative conclusion can be arrived at.

In cancer of the cervix uteri, radium therapy has reached a high position, a few surgeons prefer to give it precedence but most surgeons prefer a modified Wertheim if the disease is apparently confined to the cervix and they reserve radium for the borderline and the advanced cases. With added experience the author believes radium is destined to replace operation in all but early cases of cervical carcinoma.

In cancer of the fundus uteri only very advanced cases are recommended for radium. Clark is quoted and commended: "In cancer of the cervix, when in doubt, use radium. In cancer of the fundus, when in doubt, operate."

Radiotherapy of Sarcoma. DRS. REGAUD, ROUX-BERGER, JOLLY, LACASSANGE, COUTARD MONOD, and RICHARD. Paris Medical, Feb. 2, 1924.

THIS paper is a report issued from the Radium Institute of Paris and this abstract of it appears in the Lancet of March 8th, 1924. The writer says that "sarcoma" covers a very mixed collection of new growths, "whose origin, structure, degree of malignancy, clinical evolution, and response to radiotherapy vary so greatly that the first need is for a more accurate classification of this group of growths. Of its malignancy and refractoriness to treatment in most cases there can be no doubt. Of the 62 patients treated at the Radium Institute in the years 1919, 1920, 1921, only 16 were alive at the beginning of 1923 and the permanency of the recovery of these 16 cases could certainly not be guaranteed. Of the 25 patients suffering from lymphoid sarcoma, eight were treated with the x-rays alone, five with radium alone, and ten with the two methods combined. There were also two patients who were given combined radiotherapy supplemented by operative interference. Early in 1923 six of the patients in this group were still alive, and of the 19 patients who had died, nine had been rid of their primary lesions, and several had for more than a year enjoyed apparent recovery. Of the remaining ten patients none had achieved local recovery, although some diminution of the primary growth had taken place, and in almost every case there had been appreciable amelioration. It would seem that radium is to be preferred to x-ray treatment only in exceptional cases, and that x-ray treatment is capable of achieving local recovery in most cases of lymphoma and myeloma. The metastases which are so very common, presumably start before the successful treatment of the primary lesion is instituted and this fact is the chief stumbling block.

If it were only possible without danger to the patient to make an exploratory excision and identify the histological type of the growth, radiotherapy could be used with the types which are most sensitive to the rays, since this cannot be done radiotherapy is rather empirical. Operative treatment is usually ineffective and often worse, in cases of lymphoma and myeloma (unless a myeloma of the limb, which can be removed by amputation of that member), and in such cases x-ray treatment is justifiable. In cases of fibroplastic sarcoma operative treatment is to be preferred.

The Contour of the Isolated Entire Duodenum. J. BUCKSTEIN, M. D., Am. J. Roentgenol. 11:293, March, 1924.

ORDINARILY only a general impression of the sweep of the duodenal curve is obtainable, but the isolated entire duodenum may be filled in homogeneous fashion by the following technique: "An intestinal tube 45 inches long is constructed, so that the distal 12 inches of rubber has numerous small perforations. The tube is swallowed by the patient until the metal end reaches the duodenojejunal junction. This is determined roentgenoscopically. About 40 c. c. of a barium suspension is injected through the proximal end. The mixture on escaping through the perforations of the distal end of the tube, will completely fill the intestinal area subjected to this flow. All this region will be filled at practically one and the same time. A roentgenogram is taken immediately upon completing the injection."

The method is of value to study the variations in size of the duodenal curve as compared with variations in body habitus; to determine enlargement of the duodenal curve when there is suspicion of a tumor of the head of the pancreas; to demonstrate the intimate connection with the lumen of the intestine of a suspected diverticulum; for more accurate visualization of distortions in contour, due to extraduodenal pathology; for the detection of intrinsic changes due to ulceration or infiltration in regions beyond the first portion of the duodenum.

Surgical and Roentgen Treatment of Carcinoma of the Rectum. ERNST A. MAY, M. D., Am. J. Roentgenol. 11:246-251, March, 1924.

IN the author's clinic treatment of every rectal carcinoma is begun with the formation of an artificial anus, whether or not the case is an operable one and whether or not it gives manifestations of stenosis. At the operation the roentgenologist determines the exact extent and situation of the tumor with respect to the fixed points of the body—this, that he may work out his radiation plan in transverse and longitudinal charts. The operation is such that a small abdominal anus, which cannot prolapse because of its short sigmoid mesentery and which is easier of control than a sacral anus, is provided. Irrigation of the idle gut is begun a few days after the operation with the result that the inflammation subsides and the tumor becomes smaller.

Ten days after colostomy, roentgen treatment of the carcinoma is begun and requires great care. This treatment should never be done by an assistant but by the roentgenolo-

gist himself. The principle object in treatment is to direct the bundles of rays to the tumor and its bordering lymphatics, using as hard rays as possible in large enough dosages to cause shrinkage of the tumor but the sound tissue is spared as much as is possible. Holfelder's plan of radiation seems best but the details will vary with each case.

The radiation will produce irritation of the mucous membrane of the bowel, the first stage of which will be indicated by swelling and slight erythema with an 80 to 90 per cent erythema dose; the second stage resulting from 110 to 120 per cent, presents frank inflammation, fibrin formation, cell desquamation and bloody mucous discharge. A generalized overdose will produce ulceration.

Nearly all carcinomata will shrink under this treatment, often the inoperable cases become operable and all operable tumors are subjected to operation. The most radical measures are used in every case about four weeks after the preoperative raying. Even metastases to the liver or neighboring organs if there is a chance of removing the primary growth does not prevent operation. Six weeks after the wound has healed a postradiation is given in every case.

Control of Hyperthyroidism. KENNON DUNHAM, M. D., and JOHN H. SKAVLEM, M. D., Am. J. Roentgenol. 11:260-264, March, 1924.

HYPERTHYROIDISM is a generalized neuro-endocrine dysfunction in which swelling and hyperactivity of the thyroid gland is an incident. Complete and correct diagnosis is necessary before treatment is carried out, the damage already wrought must be determined and prognosis based thereon. Relief may be promised from hyperthyroidism but relief from all symptoms may not be promised, for although many damaged hearts recover others do not.

The roentgenologist must be a physician, not a machine operator. The author believes that a knowledge of symptoms, appreciation of the psychology and understanding of the pathology of these cases and the intelligent use of the roentgen ray and basal metabolism is all that is required.

In the discussion following this paper, Dr. Holmes states that he did not agree with Dr. Dunham that all cases of hyperthyroidism should be treated by roentgen ray any more than he believed that all should receive surgical treatment. In his reply Dr. Dunham said he agreed with Dr. Holmes and that only toxic cases and those showing an increased metabolic rate should be treated by roentgen ray.

Use of the Roentgen Ray in Pertussis. RALPH D. LEONARD, M. D., Am. J. Roentgenol, 11:265-267, March, 1924.

EVIDENCE here presented is not regarded as absolutely conclusive until further study has been made, but from his experience with 400 cases of pertussis the author is of the opinion that the roentgen rays relieve symptoms in at least 75 per cent of cases, when used in the paroxysmal stage. In children under one year of age nearly 100 per cent were relieved. This of course may indicate that not enough dosage was used upon the older cases. Vomiting was promptly relieved and there was diminution in the severity of the symptoms and also in the number. Occasionally there was a drop from about 20 paroxysms in 24 hours to two or three paroxysms. The rays do not seem to shorten the course of the disease to any marked extent except in children one to two years of age and when used in early stages do not seem to prevent the onset of paroxysms. The author believes that the roentgen ray offers one of the best means for controlling the severe symptoms of whooping cough.

Radium Report of the Memorial Hospital, New York City. Second Series, 1923. Octavo. Extra Cloth. Pp. 293. Illus. 55. Price $5.00. Paul Hoeber, New York City.

THE MEMORIAL HOSPITAL issued its first Radium Report in 1917. This, the second report, has been delayed for two reasons, namely that there have been many changes in technique during the development of the work and that it was thought desirable to await dependable end results before making any report.

For the forms of carcinoma discussed in this report the Staff believes that no radical changes in either technique or end results are likely to occur for some time. There are several diseases the radiation treatment of which is still in an experimental stage at this institution and hence no mention is made of these in this report.

The table of contents covers the following: I. Present Status and Scope of Radium Therapy at the Memorial Hospital, Janeway. II. Technical Principles Employed in Radium Therapy at the Memorial Hospital, Janeway. III. Malignant Tumors of the Intraoral Group, Quick. IV. Carcinoma of Rectum, Quick. V. New Growths of the Parotid Gland. VI. New Growths of the Eyeball and Orbit, Quick. VII. Malignant Tumor of the Skin, Quick. VIII. Use of Radium in Cancer of the Female Generative Organs, Bailey and Quimby. IX. Vulval and Vaginal Cancer Treated by Filtered and Unfiltered Radium Emanation, Bailey and Bagg. X. Follow-Up Results of 908 Cases of Uterine Cancer Treated by Radium, Bailey and Healy. XI. Technique and Results in the Treatment of Carcinoma of the Breast by Radiation, Lee. XII. Treatment of Recurrent Inoperable Carcinoma of the Breast by Radium and Roentgen Rays, Lee. XIII. Results of the Treatment by Radiation of Primary Inoperable Cancer of the Breast. XIV. Carcinoma of the Prostate. XV. Radium Treatment of Carcinoma of the Bladder, Barringer. XVI. Radium Therapy of Teratoid Tumors of the Testicle. XVII. Epithelioma of the Penis, Barringer and Dean. XVIII. Present Field Use of X-Rays and Radium in Treatment of Malignant Tumors, Stone. XIX. Analysis of Radiation Therapy in Cancer. The Muetter Lecture, Ewing.

A number of these reports have already appeared in the literature. The collection is a most valuable work at a very reasonable price.

Epitome on Blood Pressure. By BURTON BAKER GROVER, M. D. Paper, 76 pp., 16 mo. Electron Press, 1924, Kansas City, Mo. Price $3.00.

THIS book is what its name implies, an epitome upon the subject of blood pressure. In the preface of the book, Doctor Pacini says: "There is nothing to subtract from the essay, and it is certain that Doctor Grover's epitome cannot fail to interest all workers in cardiology; but its truer usefulness lies in carrying important messages to the general practitioner who, being destitute of facilities for acquiring expert guidance in cardiologic inquiry, must rest content to have clear, concise and collected information that is immediately pertinent to clinical requirements."

The paragraphs are loosely grouped under the headings of arterial tension, etiology, the sphygmomanometer, energy index, prognosis, interpretation, pulse rate comparisons, and treatment. A table of contents with these headings and page index to them would be a useful addition to the little book, although it

is easily handled. The type is very readable, the paper of fair grade.

A key to blood pressure is printed upon stiff cardboard and fits into a cover pocket. Of this key the author says it is not intended to interpret all blood pressure readings but in most instances it will suggest the most probable condition present.

Spondylolisthesis, a Common Lumbosacral Lesion. WILLIAM B. BOWMAN, M. D., Am. J. Roentgenol. 11:223-228, March, 1924.

THE author is of the opinion that many of these cases are accompanied by fractures of the articular facets of the vertebrae and that this can be roentgenographically demonstrated. The condition is a common cause of pain in the lower back and is usually the result of trauma, the injury being considered of minor importance at the time and the symptoms not so severe as would be expected with this type of lesion, but prone to grow worse after injury. The patient often gives a history of a feeling of something having given away at the time of the injury. Many cases diagnosed as sacro-iliac dislocations and which the roentgen examination has failed to clear up are in reality cases of spondylolisthesis.

Clear, detailed lateral roentgenograms of the lumbosacral region are absolutely essential in diagnosing these cases. Anteroposterior roentgenograms of both the lumbar spine and sacro-iliac region are first made with the patient lying flat on the back, feet together, toes up. Stereoscopic roentgenograms are of additional assistance but the author says he has never been able to make diagnosis from the anteroposterior plates alone. Lateral roentgenograms are made with the patient lying at right angles to the median plane in as comfortable a position as possible, there must be no movement. Sometimes the shoulders must be elevated, or the upper dorsal vertebrae, using a pad beneath so as to keep the bodies of the lumbar vertebrae as nearly parallel to the plate as possible. One lateral plate should be made of the lumbosacral joint alone, using a small cone and with the central ray passing directly through the joint. In fact, the author says, the diagnosis depends entirely upon getting a clear and detailed lateral roentgenogram of that region. "The fact that these cases have not been diagnosed more frequently is due to the difficulty in obtaining good lateral roentgenograms of the fifth lumbar and first sacral vertebrae through the crests of both iliac bones." With modern equipment this is now possible.

Bone Dystrophies of Variola. J. W. CATHART, M. D., Am. J. Roentgenol, 11:229-231, March, 1924.

WHETHER there is a specific bone lesion and whether it occasionally produces changes in developing bone that show distinctive roentgen ray characteristics are the two things discussed. Two cases are presented which show that necrotic foci are scattered throughout the system, as an evident result of variola, and that when the disease is sufficiently extensive, ossific centers in developing bone may be destroyed with consequent marked deformities, shortening, deflection, etc.

Roentgen Rays in Rickets and Modifications in the Course of Treatment by Use of Ultraviolet Rays. DRS. E. LESNE, L. DE GENNES, V. MARLOW and L. J. COLANERI, La Presse Medical 32:265-267, March 26, 1924.

AN exact and rigorous technique in roentgenological examination will enable one to accurately detect the lesions of the epiphyseal diaphyses in all stages from the initial phase. A series of radiograms in the course of treatment by ultraviolet rays pictured very exactly the rapid changes which took place under this form of treatment. The authors are quite convinced that this form of therapy surpasses in efficacy and rapidity of results all other treatments so far tried. The prophylactic value of the rays is incontestable and in combination with dietary measures (not specified), will in the next decade make any advanced case of rickets a thing unknown.

Regeneration of Bone After Intensive Radiation of Malignant Disease. C. C. ANDERSON, M. B., Ch. B., D. M. R. E. ,British J. Radiol. 29:37-43, February, 1924.

THREE cases are reported. One was a sarcoma of the sternum, another was a round-cell sarcoma of the jaw and a third was presumably a sarcomatous ilium with enlarged hip and a fracture at the level of the acetabulum and one just behind the pubic symphysis.

The author says that these cases show indubitably that continuity of the bone, the seat of a fracture caused by malignant disease—especially when sarcomatous in origin—can be restored by intensive radiation whether the disease is primary or secondary. Of course the expectation of life in osteosarcoma is extremely limited but in these cases a longer lease of life has been afforded. In the hip case the improvement was particularly marked, there being no suggestion of a fracture, the size normal and the patient being enabled to walk with only a slight limp whereas she had used crutches before.

Sources of Error in Roentgenological Diagnosis of Peptic Ulcer. R. T. Wilson, M. D., Texas State J. Med. 19:605-607, March, 1924.

IN suspected cases the burden of proof rests upon the roentgenologist. History of the case, clinical and laboratory findings should have no part in the roentgenologist's arrival at a diagnosis but the clinician should make the correlation.

Alterations of peristalsis, spastic contractions, retentions, etc., if unaccompanied by permanent contour deformity, are of no value. If the deformity in question is due to cancer outside the stomach and duodenum then peptic ulcer is eliminated, i. e., contour deformity is insisted upon and it must be of intrinsic origin.

"Reflex spastic contractions are often seen in the stomach and duodenum associated with abdominal inflammations, such as cholecystitis, appendicitis, pyelitis, acute pelvic infections, etc. These reflex contractions are transitory, and a few moments continuous observation will reveal the fact that they are changeable and leave no constant or permanent deformity. Pressure from neighboring organs, such as the liver, gall-bladder, pancreas (especially in cases of tumors of these organs), the gas filled colon, the gravid uterus, etc., while often difficult can usually be excluded by manipulation, and by causing the patient to assume various oblique positions."

Perigastric adhesions may be the source of irregularities of the stomach and the duodenum resembling ulcer. Differentiation may be made through careful observation of the course of the doudenum to note whether there are sharp angulations and whether there is complete filling at intervals or a constant and permanent deformity. Types of deformity mentioned are the niche, pocket, cauliflower-like perforation and induration of the meniscus.

Ulcer usually shows a smooth contour while carcinoma usually has irregular margins.

Certain errors of technique are sources of erroneous conclusions. The following points are insisted upon: opaque media well suspended in liquid from and free from coarse particles; patient examined in a fasting state without previous lavage, so that the stomach is as nearly empty as possible—if liquid content is then

found the fact must be explained by subsequent findings; plenty of time for eye-accommodation when using the fluoroscope; sufficient current both voltage and milliamperage.

Perfection in this work is not to be expected but the field offers great possibilities. To make this service to the patient practical it must be economical and physicians must be encouraged to call upon the roentgenologist for help in these cases.

A Large Pure Uric Acid Renal Calculus. A. E. BARCLAY, M. A., M. D., D. M. R. E., British Jour. Radiol. 29:73-76, March, 1924.

URIC acid stones in the bladder and kidney cannot be demonstrated by the most perfect radiological technique. Kidney stones with even a small per cent of uric acid are rare and a pure acid stone of any size in the kidney is extremely unlikely.

The author presents a report of a case in which the x-ray diagnosis was negative but operation revealed a stone weighing 2.7 grams and measuring one inch in length and more than one-half inch in thickness and width at its largest diameter.

The stone was placed on a plate with other objects and radiographed, and even at its thickest diameter its capacity was less than ½ mm. Al. The whole stone was then analyzed at the Manchester University laboratories and the only substance found was uric acid.

Pyelography. WALTER W. GALBREATH, M. D., Ch. B., Glasgow Med. J., 101:14-22, January, 1924.

THE dangers of pyelography lie in the opaque solution, pressure used in injecting it, trauma to ureter and kidney pelvis, sepsis, and constitutional disturbance.

The author prefers sodium iodide, 12 per cent solution, as it gives a good shadow and is harmless and though not antiseptic can be sterilized by boiling. No force is ever used in making the injection, to wait for pain as a signal to discontinue injection is to run the risk of damaging the delicate kidney substance.

Sepsis introduced from without is inexcusable; technique should be rigidly surgical. The possibility of sepsis being carried from the bladder to the kidney must be taken into consideration. Though pyelography may be a useful aid in chronic cystitis it is nevertheless dangerous to pass a ureter catheter in acute cystitis.

To avoid trauma to the ureter and kidney pelvis the catheter should not be larger than a No. 5 of the French scale and should be passed slowly and gently, not farther than 28 cm., for safety use a catheter with centimeter markings. If obstruction is met the catheter should be stopped and then slightly withdrawn.

Constitutional disturbance is no greater than is that caused by the passage of an urethral catheter into the bladder in a healthy adult. Immediately after pyelography the author administers 10 grs. of quinine sulphate followed by copious barley water. The patient may think he is well enough to go home at once but he should be made to lie down a couple of hours first.

The Gall-Bladder: Its Past, Present and Future. The Muetter Lecture of the College of Physicians, Philadelphia, December 7, 1923. J. E. SWEET, A. M. M. D., Sc. D., Professor of Surgical Research, University of Pennsylvania. International Clinics, 1:187, March, 1924.

THE author, after years of investigation, totally revolutionizes our present views of the function of the gall-bladder from various angles, bearing in mind the possible bearing of the known facts upon the problem of the function of the gall-bladder.

Under the *past* of the gall-bladder, Dr. Sweet reviews our knowledge of its embryology, and points out as the most striking result of this mode of study of the gall bladder, the fact that the gall-bladder arises as an independent unit from that group of ancestral cells at the lower end of the foregut, which gives birth to such important structure from the standpoint of absorption and of secretory function, as the stomach and the duodenum, the liver and the pancreas. The relation of the embryology to the occurrence of accessory ducts is also pointed out.

Under the *present* of the gall-bladder, the author discusses the structure and anatomical relations of the organ, and the bearing of these facts upon its possible function. The nature of the muscular coat of the organ is shown to be that of a *muscularis mucosae*, having no function in emptying the organ. The position of the gall-bladder at the lowest point of the duct system and the provision of two-valve structures at its inlet, point toward an ease of filling and a difficulty of emptying. The unusual blood and lymph supplies of the gall-bladder are also discussed.

Sweet also calls attention to the peculiar pouchings of the mucous membranes of the duct-system, called parietal sacculi, which were known to the older anatomists, but which seem to be entirely unknown to the present generation. These are very definite structures, which can be demonstrated by injecting the duct-system. They do not seem to be glandular, but have the same structure as the gall-bladder. The author inclines to agree with the old anatomist, Beale, that we must look upon these structures as accessory gall-bladders. The author offers some experimental indication that these structures hypertrophy after cholecystectomy.

Under the *future* of the gall-bladder, the author does not attempt the analysis of the various theories that have been offered. He assumes that the careful study of the embryology and anatomy points to the conclusion that the organ is designed for absorption. He discusses the relation of the gall-bladder to metabolism, a theory proposed by Virchow many years ago. Experiments on the relation of the gall-bladder to cholesterol-metabolism are presented, which show conclusively that some relationship does exist between the gall-bladder and this substance. Experiments are also cited which tend to show that the parietal sacculi undergo hypertrophy after the removal of the gall-bladder.

The author's conclusions are summed up as follows: "The manner of origin and development of the duct system of the liver, indicates, I believe, that the membrane lining this system may be possessed of powers of absorption; the complex structure of the gall-bladder, the rich blood supply, the unusual lymphatic supply, point to an absorptive function. The position of the gall-bladder, the provision of two valvular structures at its outlet, which are manifestly designed to permit inflow and to hinder outflow, lead me to the conclusion that under normal conditions whatever passes into the gall-bladder through the cystic duct, never passes out again through the cystic duct." The bile contained in the gall-bladder is evidently absorbed, and in this process of absorption it would seem that the cholesterol esters of the blood are influenced.

Roentgenological Evidence of Apparently Healed Miliary Tuberculosis of the Lungs. EDWARD S. BLAINE. Am. J. Roentgenol. 11:233-237, March, 1924.

OCCASIONALLY a roentgenologist will encounter what the author terms a rare and startling film of the thorax in which numerous shotlike

shadows are distributed evenly over both pulmonary fields. The shadows are multiple, disseminated, rounded in outline, of marked density, edges sharply bordered and the size not over three millimeters in diameter at the most, the shadows are distinctly discrete and well separated. In none of the three cases presented by the author was there any degree of fibrosis of the lung.

In acute form the shadows instead of appearing as above described, are smaller, soft and hazy in outline and lie very close together, giving a mottled appearance to the lung field.

These shadows do not represent the beginning of a single tubercle, inasmuch as this is of microscopic size, but when fully developed, it reaches the size of a millet seed and the resultant shadow area is larger than the lesion itself.

Postmortem studies reported from the literature show that at rare intervals there is an individual presenting a case of healed miliary tuberculosis of the lungs, calcification being the sole evidence of the disease.

Radiology in the Diagnosis of Pulmonary Tuberculosis. Edinburgh M. J., 31:171-175, March, 1924.

THIS paper reports a discussion and x-ray demonstration held at Ruchill Hospital, Glasgow.

Dr. A. S. Macgregor said that x-ray photographs should be approached from the clinical standpoint, else bizarre misinterpretations will result. Evident enlargement of root shadows does not necessarily give evidence of tuberculosis. The shadows may be normal for that particular individual.

Dr. J. A. Wilson said there was too great a tendency to regard all chronic respiratory disorders as tuberculous in character, he believes there is too little clinical and less pathological justification for such a practice. A chronic bronchitis with some dullness over an upper lobe, associated with an x-ray film showing fibrosis of the lungs does not give a pathological justification for such a diagnosis. Hilum tuberculosis is rare. Basal lesions are non-tuberculous, unless there has been a tuberculous infection of the abdomen.

Abscess of the Lung Roentgenographically Considered. WILLIAM H. STEWART, Am. Clin. Med. 2: 312-329, March, 1924.

THE clinical picture of pulmonary abscess, when typical, is sufficiently characteristic to make the diagnosis certain, but to locate the lesion is not so easy. The x-ray is of great value for this and also gives accurate information as to the extent of the process and the presence or absence of associated pathological conditions.

Pulmonary abscess, when seen early by the means of x-ray, shows as a pneumonitis of varying degree. The shadow is oftener oval than circular, the edge being clear-cut or shading off into the other structures. In a later stage, there will be seen within the center of the shadow a darker area, indicating softening or cavity formation. Cavities may be single or there may be several. If the cavity is filled with secretion, one cannot distinguish between infiltration and fluid, but if only partly filled, there will be seen a straight upper border of the dense shadow within the cavity. Observation with the patient in the erect and in the lateral positions will prove the presence or absence of fluid in the cavity. Abscesses of old standing will have well established pyogenic membranes with very little surrounding infiltration and so can be readily outlined roentgenographically. Multiple lung abscesses are present oftener than suspected. Postmortem often shows them where the x-ray plate has revealed only one. No lung abscess can be pronounced completely cured unless every roentgen sign of the lesion has disappeared.

A small sacculated empyema is the most common lesion to be mistaken for a lung abscess. Differentiation is difficult and one must rely largely upon the clinical symptoms and a clear clinical knowledge of the entire course of the illness is necessary; it is important to know that the presence of foul smelling sputa indicates the involvement of pulmonary structures.

The presence of hemorrhage in the chronic forms of lung suppuration, together with cough and excessive expectoration, may lead to a diagnosis of pulmonary tuberculosis. In the x-ray film, cavities in this disease show little, if any, surrounding infiltration and seldom have enough secretion present to show an air bubble with a fluid level.

The roentgenologist and the bronchopist should work together in cases of lung abscess, for acute infection is no contra-indication to the establishment of free drainage, although hemorrhage as a complication is a contra-indication, likewise so is suppuration if complicated by a sacculated empyema. A large amount of induration with but little softening, especially in the upper lobes, calls for surgery. The question when bronchoscopic treatment ends and surgery begins is a debatable one.

In making localization for operative procedure, the roentgenologist, with the aid of the surgeon, should duplicate the surgical position, else localization may be misleading; and by fluoroscopic control one should diaphragm down the rays so that the central portion will pass directly through the center of the shadow representing the abscess. It is necessary also that the relation between the abscess shadow and certain easily recognized bony landmarks should be stated clearly. Skin marks are not satisfactory. The ideal method of locating a lung abscess is by fluoroscopy in two planes, as advocated by Dr. Manges of Philadelphia. Ten case reports with illustrative films are submitted.

The X-Ray Diagnosis of Chest Infections in Childhood. HENRY K. PANCOAST, M. D., Arch. Pediat. 41:93-199, March, 1924.

THE chest of the infant and the young child presents a most difficult field for x-ray diagnosis, not only because of lack of coordination on the part of the child, but because from a radiographic standpoint the child's chest presents anatomical peculiarities and its pathology is different from that of the adult.

In the child, as a rule, slight or less serious infections show their imprint relatively more noticeably in the radiograph than they do in the radiograph of an adult. The shadows are to be recognized as alterations in the hilum and trunk shadows, linear markings and the relatively clear parenchymal portions of the linings. Enlargement of the lymph nodes also shows in shadow as does fluid or pleural exudate. The normal must be very clear in the radiologist's mind and he must also know that disease of the child shows only slight variations from the shadows shown in the normal.

Cooperation with the clinician is an aid which neither clinician nor radiologist can, in justice to the patient, do without, since many different pathologies present almost the same x-ray picture.

Enlargement of the tracheobronchial lymph nodes and intensified hilum and trunk shadows and linear markings are common to all infections, hence etiological interpretation is apt to be wrong unless the x-ray findings and the clinical data are correlated. Enlarged tracheobronchial lymph nodes may or may not be of importance, depending upon size, number and whether they are

conglomerate into dense hilum masses, producing massive shadows. A few discrete small palpable nodes in the child's neck are not a cause for alarm, nor should they be considered as such if found in the chest. Calcification in a few small glands is of no significance clinically. Intensified shadows of the lung parenchyma indicate a pathological entity as pneumonia, abscess or atelectasis.

X-ray examination in lobar and bronchopneumonia may be a valuable aid to diagnosis, especially when clinical evidence is uncertain, as these diseases present very characteristic radiographic appearances.

In lobar pneumonia, there is usually found a rather uniform and diffuse, slight, hazy shadow which may start anywhere in the lobe and involve it entirely, usually being limited to one lobe. In the well advanced stage there is a comparatively dense and rather homogenous shadow more or less wedge shaped, the base outward ,the outline irregular, unless perhaps it may be sharply defined at the fissure. During resolution the appearance is much as it is at the outset, with more or less mottling, also the trunk and hilum shadows will be very prominent and the x-ray may reveal the true nature of the lesion before its physical signs become definite.

Bronchopneumonia is more difficult to recognize. Typically, the first evidence will be an irregular dense mottling with the appearance of conglomerate tubercles. Several areas may coalesce into a definite irregular area of apparent consolidation resembling lobar pneumonia. This condition is more frequently found in the bases, but may be more or less diffuse and may or may not be limited to one lobe. The mottling and many of the areas of consolidation may give the appearance of tuberculosis.

Bronchpneumonia may become chronic. It involves the interstitial tissue, especially with a marked proliferation of connective tissue together with a filling of the alveoli with organized products of the inflammatory process. The bases are most frequently affected. Ulceration of the bronchi is common with resultant small abscesses. Differentiation from tuberculosis is difficult. A minor degree of bronchopneumonia gives a history of rales and impairment of one or both bases. The x-ray findings show some intensification of trunk and hilum shadows with a small area of increased density or definite mottling at the base.

Pulmonary tuberculosis in childhood does not show such characteristic x-ray appearances as in the adult life and the appearances are quite different. In the early stages, particularly, the predominant features are in the hilum region, the parenchymal regions being involved later and the typical mottled appearance may then be quite striking if seen before consolidation takes place, which will be in a later stage.

In the typical early case of purile tuberculosis, the x-ray shows an enlarged hilum shadow with increased density, due, in part, to definite lymph node enlargement. Glands may be more or less discrete or appear as a dense mass.

Radiating from these shadows are the much accentuated trunk shadows. Large gland masses have at times been mistaken for enlarged thymus. Later, the parenchymal portions of the lungs show shadows of individual and conglomerate tubercles and consolidations. In early purile tuberculosis the x-ray examination has little etiological diagnostic value unless carefully correlated with clinical data. If a case presents the symptom-complex of tuberculosis, with or without positive sputum, and such an appearance as herein described is revealed in the x-ray of the chest, it may be taken as corroborative evidence of tuberculosis, but the x-ray findings alone should never be taken as such evidence.

Peanut Kernels in the Lungs—Roentgen Ray Diagnosis of Nonopaque Foreign Bodies in the Air Passages. WILLIS F. MANGES, M. D., Sur. Clin. N. A. 4:54-65, February, 1924.

THE x-ray signs in the diagnosis of nonopaque foreign bodies in the air passages do not depend upon the shadow cast by the foreign body, but upon some change in the mechanics of the air passages, a change brought by the foreign body plus the pathologic changes in the immediate vicinity of the body and of the bronchial distributing distal to the foreign body. There will be some degree of obstruction, more or less accumulation of exudate, changes incident to infection, and displacement or the malfunction of the viscera due to changes in shape, size and function of the affected lung.

Obstruction: The air enters more easily than it escapes and the affected lung is constantly overdistended with air (obstructive emphysema). Compensatory emphysema (lung fully distended at end of inspiration but expelling great deal of air at expiration) may be present and there may be atelectasis, that is, neither entrance nor exit of air and collapse upon the air already present being absorbed . Regarding atelectasis a mistaken diagnosis may very easily be made if the patient has had an old chronic pleuritis unknown to the roentgenologist, for with such a history there may be marked pleural thickening associated with fibrosis of a portion of the lung, and contraction.

Exudate: Exudate from the inflammatory process may collect distal to the foreign body and fill the parenchymal portion of the lung supplied by the involved bronchus. The shadow will be only fairly dense and the detail in the shadow of the bronchial tubes shows through the exudate; the area involved will be conical in shape with the apex of the cone touching the foreign body and usually a moderate degree of atelectasis will be present.

Infection: This gives the same sort of appearance as lung abscess from any other cause. The density of the shadow will obscure the bronchial detail and the shape of the lesion is apt to be more rounded than in exudate and cavities will sooner or later appear.

In obstructive emphysema the heart and other mediastinal structures are displaced to the unaffected side and the diaphragm on the affected side is displaced downward, but there may be considerable variation here. Extreme cases will show marked displacement of the mediastinal structures and of the diaphragm at the *end of expiration*. One plate should be taken at full inspiration and one at end of expiration—with children one must watch his chance for a favorable moment and use a time switch for short exposure. Films must be marked so one can afterwards tell whether taken at inspiration or upon expiration. Often more than one film must be taken. If the fluoroscopic examiation shows striking lateral motion of the heart and aorta synchronous with the breathing cycle, the diagnosis is positive, whether the films are satisfactory or not. Also, even though the two halves of the diaphragm may be normally related in position at the end of inspiration the diaphragm on the opposite side will show a diminished excursion. If the expiratory obstruction is marked, the affected half of the diaphragm may be even lower at expiration than at inspiration, due to the rather powerful contraction of the intercostal muscles in an effort to expel the air.

The clinic was closed by the demonstration of a case of a three-year-old child having a peanut kernel lodged in the lung.

Diagnosis of a Foreign Body in a Bronchus. THOMAS MCCRAE, M. D., Surg. Clin. N. A. 2:16-26, February, 1924.

THE x-ray plate will show the foreign body clearly only if it is opaque. If the body is nonopaque, then only a roentgenologist skilled in such interpretation can give an authoritative opinion. Dr. Manges is quoted as authority for the claim that by careful study it becomes as easy to locate a nonopaque as an opaque body in the bronchus. Many men trust too much to x-ray diagnosis in these cases and not enough to physical signs which are the best means of diagnosis if the opinion of an expert roentgenologist cannot be secured.

The X-Ray Diagnosis of Surgical Conditions of the Esophagus. H. K. PANCOAST, M. D., Surg. Clin. N. A. 4:34-53, February, 1924.

THE usual procedure in the x-ray diagnosis of obstruction of the esophagus are (1) swallowing bismuth subcarbonate or barium sulphate suspended in water or buttermilk; (2) swallowing a bolus of powdered subcarbonate of bismuth or barium sulphate mixed with jam or marmalade; (3) swallowing a capsule containing some of the opaque powder. The author, if he were restricted to any of the three alone, would select the capsule.

Positions: (1) Erect, left shoulder blade against screen or plate, rays directed from the right side of the chest anteriorly; (2) reverse of first position; (3) patient lying obliquely prone on horizontal fluoroscopic table, right side of chest on table and screen or plate against the left scapular region, left knee flexed to abdomen and both arms overhead. This position makes the act of swallowing slower, thus permitting a better view of the passages of the opaque body.

In general, obstruction of the esophagus may be due to pressure from without, changes in the walls of the esophagus, foreign bodies or reflex causes.

Pressure may be due to (1) aneurysm, usually of the arch of the aorta; (2) neoplasm; (3) enlarged glands in the mediastinum (pressure from mass or from scar tissue); (4) mediastinal or spinal abscess; (5) a large dilated heart.

Changes in the wall of the esophagus may be due to (1) encroachment of a carcinoma upon the lumen, constriction due to its growth or local spasm due to irritation from ulceration; (2) benign ulceration with resulting spasmodic contraction; (3) cicatrization from old ulcer, the result of swallowing a caustic or as a sequel to syphilis, typhoid or tuberculosis.

The best way to diagnose and study a carcinoma of the esophagus is by a combination of x-ray methods and the esophagoscope. The capsule will often detect carcinoma when other means have failed. A complaint of substernal pain should lead to exhaustive search and the capsule method must never be omitted in such cases. Two case reports are given to illustrate these two points.

It is usually better to employ barium suspension before the capsule is used, as the latter may plug up the caliber of the obstruction. It is unsafe to pass any object down the esophagus for diagnostic purposes until a careful x-ray study of the esophagus has been made.

Foreign Bodies: An opaque body is usually detected easily, but the fluoroscopic examiation alone should not be relied upon, since a small body, such as the point of a pin, may thus escape detection. The roentgenologist should give the exact location, the close relation to other viscera (particularly the arch of the aorta and the trachea), the direction in which the body lies, the location and direction of points of pins, dental plates, etc. A second examination after removal is wise, as there may be two foreign bodies present, the first obscured by the second, e. g., author's case in which two coins lay close together.

Non-Opaque Bodies: Such a body may be detected by the fact that it may (1) obstruct the passages of an opaque liquid in a semi-solid food; (2) cause the opaque food to canalize on one side or back or front of the foreign body; (3) become opaque when capsule dissolves after swallowing a capsule of opaque powder; (4) obstruct the capsule.

A piece of meat or potato has been mistaken for a growth in the esophagus. Differentiation between bodies in the air passages and in the trachea is important as it is sometimes very easy to be mistaken here. The body may be in the esophagus and ulcerate through or nearly through and appear to be in the trachea.

Reflex Disturbances: These may arise from new growths, ulcerations and inflammatory lesions in the neighboring larynx or the neck, ulcerations and new growths at the cardiac end of the stomach. Also, they may arise in neurotic or hysterical individuals or in cases of bulbar paralysis and in phrenospasm. In this last the important points in diagnosis are: (1) very marked curve of the lower end of the esophagus to the left in the direction of the stomach; (2) if the patient be given a sufficient quantity of food to overfill the esophagus, the spasm will be more or less relaxed and food will enter the stomach in spurts and frequently in very large quantities, whereas, before overloading, little or nothing passed. Sometimes a supposed tumor turns out to be a dilated esophagus.

X-ray study should precede the use of both esophagoscope and bougie.

Roentgen Ray Treatment of Fibroids of the Uterus and of Menorrhagia and Metrorhagia Not Due to Malignancy. JOHN D. WILLIAMS, M. D., Am. J. Roentgenol. 11:252-255, March, 1924.

THE author bases his observations on the treatment of more than 500 cases of uterine fibroids and of non-malignant hemorrhage treated throughout the past nine years.

This treatment is indicated in fibroid tumors of the uterus, except the pedunculated submucous type, or those showing degeneration; in functional menorrhagia and metrorrhagia of adolescence; in menorrhagia and metrorrhagia without evidence of gross pathology and most commonly observed in the fourth decade; in menorrhagia and metrorrhagia due to metritis or endometritis of hypertrophia or polypoid nature. Contraindications are found in infection whether active or latent in the pelvis and in complicating lesions requiring surgery for relief. A complete pelvic examination should be made by a competent diagnostician before instituting this form of treatment.

The new technique of giving treatment through a single large portal has been in use about two years and the author has treated about 150 patients by this method. He thus describes the technique: "In the ordinary cases, without a large tumor, the portal is 10 by 15 cm., the long diameter being transverse to the vertical axis. The lower margin of the opening is level with the top of the symphysis. The factors are: 9" spark gap, 125 kv.; 5 ma.; distance, 37½ cm. (15 in.); filter ¼ mm. Cu and 1 mm. Al; time one hour." This treatment, using pads of 8 sheets of cotton wadding under the lead protection rarely causes any skin reac-

tion. If it is desired to induce the menopause, treatment is repeated after two to three days through the posterior pelvic region. Two hours of treatment induces the menopause in patients over forty years of age. If the menopause is not desired, then a slight treatment is given and repeated in four weeks if necessary, and two months later a third treatment may be given if it is necessary. A fibroid uterus of the size of a five months pregnancy will be only a little above normal size after four treatments. Larger tumors will take longer.

It is most important to warn the patient against irritating applications to the skin after roentgen treatment.

Pain occurring in the pelvis after treatment indicates the presence of an infectious process. No permanent harm is likely to result from one treatment, but repeated treatments would certainly render the infection serious.

The author prefers roentgen treatment to radium.

The Value of the Roentgen Ray in the Diagnosis of Atypical Pregnancy With Report of Two Cases of Anencephaly Diagnosed Before Birth. DAVID SPANGLER, M. D., Am. J. Roentgenol. 11:238-240, March, 1924.

ROENTGENOGRAMS of the pregnant uterus are without danger to either the mother or child and they should always be made before determining upon a Caesarian operation. Also, every pregnant woman showing anything abnormal should have a roentgen examination, for they give valuable information, even though it be negative. The method is the best one for determining fetal abnormalities. It is also useful in medicolegal cases.

The Use of X-Ray Therapy in Disturbed Menstruation. A. J. RONGY, M. D., Am. J. Obst. & Gynec. 7: 169-172, February, 1924.

THE author reports the roentgenological treatment of a number of patients suffering from irregular and scanty menstruation, which soon became regular and normal. The exact dosage is not described except to say that stimulating doses were applied. All patients were referred to an expert roentgenologist for this treatment.

The Clinical Significance of Chemical and Serum Analysis of the Blood of Uterine Cancer Carriers Subjected to Measured Radiation Doses. HENRY SCHMITZ, M. D., Am. J. Obst. & Gynec. 7:449-461, April, 1924.

THE author says that radiation sickness is caused by the absorption of autolytic products from the degenerate areas of the tumor mass. This intoxication is an example of a "non-specific" reaction. "The sera of patients with carcinoma become carcinomalytic after treatment with radium and roentgen rays as evidenced by the Freund-Kaminer reaction. The results of the chemical and serum examinations of the blood of carcinoma patients would indicate that patients with extensive and necrotic cancer should be subjected to radiation therapy with a great deal of caution, using preferably a fractional interval method to prevent severe radiation intoxications. Patients with advanced carcinomata filling the small pelvis, having large necrotizing masses and advanced cachexia should not be subjected to radiation therapy." Localized and border line cases may be given the total radiation dose within the shortest possible time.

Roentgenographic Pelvimetry. W. R. MACKENZIE, L. R. C. P., L. R. C. S., Surgeon Samaritan Hospital for Women, Belfast, Ireland. Jour. Obst. and Gynec. Brit. Emp. 30: 556-564, No. 4, 1923.

EFFICIENT antenatal supervision and prenatal diagnosis greatly reduces maternal mortality. Besides demonstrating pelvic deformity and the effect of an old fracture or diseased joint, the x-ray plate will show the existence and extent of the pelvic contraction both of the inlet and outlet, and will allow comparison with the normal pelvis and also will allow measurement of the degree of contraction. Every woman should have an x-ray of the pelvis to determine her fitness for childbearing and pregnant cases should be examined toward the end of pregnancy to determine presentation, size, etc.

External measurements cannot always be depended upon to give the true size of the pelvic cavity, e. g., the iliac bone may be deformed, but the x-ray may show the actual pelvic cavity to be normal.

Heretofore, internal pelvimetry, while it gave a true idea of the shape of the pelvis gave an erroneous impression as to size, owing to the fact that the sacrum and pubis lie at different levels from the sensitive plate. One portion of the pelvis was enlarged out of all proportion to the other by the older methods.

The author's method has three constant factors of technique: (1) point of focus; (2) x-ray tube at same angle to and same distance from the sensitive plate; (3) relating of symphysis pubis to sensitive plate. His method obviates the early difficulty of x-ray pelvimetry and makes it possible to see the existence and extent of the pelvic contraction of the inlet and outlet, also to compare the pelvis with the normal pelvis and to measure its diameters without any appreciable discomfort to the patient.

A "standard" plate for pelvic measurements is absolutely necessary and the patient must be radiographed in the same position as the "standard" pelvis, the same point of focus being used and the x-ray tube at the same angle and the same distance from the sensitive plate.

Detailed and complete description of this technique is given by the aid of diagrams and illustrations, the text describing technique covers eight pages. If reprints cannot be secured from the author, doubtless copies of this number of the *Journal of Obstetrics and Gynecology of the British Empire* can be secured from the publishers, Messrs. Sherratt and Hughes, 34 Cross St., Manchester, England.

Use of the X-Rays in Antenatal Work. EDWARD W. H. SHENTON, M. R. C. S., and CHARLES H. S. HORDVITZ, M. R. C. S. The Lancet, 206:332-333, Feb. 16, 1924.

EVERY case of a primapara, where the head of the child is still above the brim of the pelvis during the last two weeks should be x-rayed to determine whether there is ample room for passage. The x-ray photograph will also give some idea of the amount of ossification of the head and this may aid in determining whether the child is overdue.

Since it is not the absolute but the relative measurements of the head and pelvis that matter, no special training is needed to determine whether passage is possible, providing that proper technique has been used in exposure.

Application of Electrotherapy in Gynecology. MARY L. H. ARNOLD SNOW, M. D., Am. J. Electroth. & Radiol. 42:1-4, January, 1924.

THE author recommends treatment by electrotherapy in most all pathological conditions found in gynecology and under the term electrotherapy she includes all modalities from an electrical source. The value of the paper lies in the specific directions she gives for using electrotherapy (in its usual meaning) in cases of amenorrhea, endometritis and chronic metritis, specific vagin-

itis and endometritis, dysmenorrhea, vaginismus, associated intestinal and gastric ptosis, urethral caruncles and hemorrhoids (desiccation) and spasmodic stricture of the anus.

The General Role of X-Rays in the Treatment of Benign and Malignant Tumors of the Uterus. U. V. PORTMANN, M. D., Illinois M. J. 45:197-200, March, 1924.

DEEP x-ray therapy alone is the author's choice in properly selected cases of benign tumors of the uterus, i. e., cases in women over forty years of age, without excessive bleeding or evidence of inflammation or degeneration. When menorrhagia must be checked at once, radium is preferred. All other cases are surgical. In carcinoma of the fundus there is as yet no indication that radium is to be preferred to surgery, but in carcinoma of the cervix a combination of radium and deep x-ray therapy is the method of choice. In general, in the treatment of malignant or of benign tumors, surgery, the x-rays and radium should be used in such combination as the case may indicate.

Surgery vs. X-Ray and Radium Therapy in the Treatment of Tumors of the Uterus. G. W. CRILE, M. D., Illinois M. J., 45:177-179, March, 1924.

THE author insists upon every patient being strictly individualized.

At the present time his judgment upon the treatment of malignant tumors of the uterus he summarizes as follows: (1) Benign Tumors—(a) Within the childbearing period partial or panhysterectomy or myomectomy. (b) In association with pregnancy, if the operation cannot be delayed, operation under complete anociation. (c) At the period of or after the menopause, radium or radium plus deep x-ray therapy unless the tumor is submucosal or superitoneal. (2) Bordeline Cases: Same treatment as that used when diagnosis of cancer of the fundus is certain. (3) Cancer of the Fundus: In all operable cases, vaginal hysterectomy. In inoperable cases, radium alone or in combination with deep x-ray therapy. (4) Cancer of the Cervix: Radium and deep x-ray therapy with reservation of final judgment as to the abandonment of surgery until sufficient time shall have elapsed to compare the results in three and five year cases.

The author's total series of carcinoma of the uterus includes 362 cases, 107 of which were cancer of the fundus.

Deep X-Ray Therapy in Gynecology. DR. RUMPF, Erlangen Clinic. Journal of Cancer 1:43-47, January, 1924.

THE author accepts the theory that myomas of the uterus are due to ovarian dysfunction and, therefore, he advises sterilization by the x-rays. He also uses the rays to suppress hemorrhages, regulating the dosage accordingly as a lasting or a temporary suppression of the menses is sought.

When it is a question of cancer treatment, then gynecologists differ as to whether operation or radiation is better. The author believes that radiation of uterine cancer has been successful, not for the reason that the cells in the matrix are more sensitive, but because (1) it is possible to apply the dose by concentrating fields around the abdomen, and (2) the uterus has no function whatsoever in the time of involution and can shrink and is not exposed to constant irritation as is the case in the intestine and stomach.

The cancer dose is not a cure-dose. The problem is both medical-technical and biological. Adequate treatment both before and after is necessary to successful results.

The author favors treatment in two stages, the second following seven or eight weeks after the first.

Measured values of dosage cannot be generalized without certain reservations. To eliminate the uncertainties of scattering effects is the task of further research.

Treatment of Cancer of the Breast. DRS. E. NEUMAN and G. BRUSSELS. Le Cancer 1:107-127, March, 1924.

THE authors use preoperative roentgen ray treatment in cancers of the breast and follow by operation and postoperative roentgen treatment. Their experience leads them to believe that these procedures lessen the chances of recurrence a great deal.

The irritation does not in any way hinder the patient's reaction after operation nor augment the percentage of secondary recurrences.

Some recurrences thus treated will regress after irradiation, others will remain stabilized.

The exact relationship of the rays to each histological type of tumor has not as yet been ascertained.

In certain slow growing types and in the aged, where general conditions contra-indicate surgery, radium sometimes gives a complete and lasting cure.

Whenever the authors find it necessary to augment the biological effect of the radiation, they employ gold or platinum ionization by injecting these metals into the tissues for the sake of the secondary radiations.

Cystograms: Their Clinical and Possible Misinterpretation. HERMAN C. BUMPUS, JR., M. D., Surg. Gynec. Obst. 38:546-549, April, 1924.

THE cystogram, while not of equal value with the cystoscope, is a valuable adjunct to it and if the possibility of its misinterpretation is understood it may give information not to be obtained in any other way.

A portion of a greatly relaxed bladder may be mistaken for a large diverticulum by the shadow cast by the dome being projected so as to make it appear to be independent of the main part of the bladder. A diverticulum located in the base of the bladder so that the shadow completely obliterates the diverticulum is also misleading, but incorrect interpretation may be avoided if the shadow is thrown clear of the bladder by tilting the roentgen tube well to one side of the pelvis, or by coiling a lead catheter in the diverticulum.

Urethral diverticula often are puzzling because it is impossible to detect the depth of the sac and its extension. In such cases the diverticulum should be filled with an opaque fluid of a different density from that used to fill the bladder and a contrast roentgenogram secured.

In freely bleeding tumors of the bladder care must be taken to exclude blood clots as a cause of filling defects, for these clots may give an entireily mistaken impression of the extent of the malignancy.

If a diagnosis of prostatic hypertrophy has been made by rectal palpation and is confirmed by a finding of residual urine, the cystoscope is not necessary. A routine cystogram will demonstrate diverticula and any residual urine. If on the other hand the patient gives a definite history of prostatic disease and rectal palpation fails to show an enlargement of the gland in proportion to the symptoms, the cystogram cannot then be depended upon concerning the intravesical enlargement.

A cystogram taken in the Trendelenburg position will readily demonstrate whether urine from the bladder passes up the ureters to the kidney, if so, and lavage of the renal pelvis is desired, it may be accomplished by simply filling the bladder with the solution desired and elevating the patient's buttocks, there-

by relieving the patient of a cystoscopic examination and ureteral catheterization. In advanced cases the cystoscope will detect this reflux of urine, but in earlier cases the cystogram will show it where the cystoscope will not.

Ths reflux also occurs in diseases of the central nervous system and if a cystogram is not taken is often overlooked.

In cases of unilateral renal tuberculosis resulting in an extensive tuberculous cystitis, the urine from the bladder flows up the ureter of the unaffected kidney, while the strictured ureter on the diseased side usually prevents an upward flow.

Technique: In making cystograms the bladder is filled with either sodium bromide, 16 per cent, or potassium iodide, 12 per cent. The latter is preferable. If there is considerable cystitis, however, it is better to use silver iodide emulsion, 5 per cent, which is soothing and which casts a denser shadow. After the bladder is filled the urethra should be compressed with a clamp or tight bandage and the first picture taken directly above the symphysis so as to throw the outline of the bladder clear of the sacrum. Two other pictures should then be taken with the tube tilted so that the first picture is projected to the right and the second to the left, thus diverticula near the base of the bladder will throw their shadows along the periphery of the bladder.

Radiography of Intracranial Tumors: Excepting Tumors of the Hypophysis. Drs. Delherm and Morel-Kahn, La Presse Medical, 32: 93-95, Jan. 30, 1924.

AT TIMES when diagnosis by other means is an impossibility, radiography will clear up the diagnosis. It is of course exceptional to secure direct visibility of the tumor, but there are a series of findings which are significant. These are erosion of the bone, particularly that of the inner table; modification in morphology of the sella turcica; enlargement of the bony sutures, particularly in children. Although calling for delicate interpretation, these modifications often give the key to diagnosis and they should always be sought.

Treatment of Tumors of the Brain (Excepting Hypophyseal Tumors) by Deep Therapy. Technique and Present Results. Drs. Bremer, Coppez and Sluys. Le Cancer 1:145-162, March, 1924.

IT IS as yet too soon to draw any fast conclusions and such these are not intended to be, but one thing has been shown true and that is that radiotherapy does have a manifestly destructive action upon certain brain tumors.

In nine patients afflicted with tumors (not hypophyseal) and subjected to intensive treatment, the results have been favorable, strikingly so in five of the cases. Three of these patients were enabled to resume their professional life.

In two other cases the favorable results were only temporary, one of these was a tumor of the corpora quadrigemina and the other was a tumor in the angle of the pons cerebelli. One patient having a tumor of the pons cerebelli and irradiated just before a decompressive trepanation was very much helped immediately. This improvement did not immediately follow the radiation and it is not possible to judge whether it was due to radiotherapy or to the operation.

Finally, in one case, radiotherapy had a distinctly unfavorable result and certainly hastened the death of the patient who was afflicted with an inoperable diffuse tumor of the base of the brain. The late symptoms, a progressive fall of temperature quickly giving place to a fever, explained, we believe, the fatal result. The tumor was probably subjacent to the centers of the floor of the third ventricle and the congestion and edema resulting brought about a pressure upon the thermic centers of the hypothalamus. This is our theory, but it is founded upon certain facts, namely, that almost always with our patients the irradiation has been followed with an aggravation of the local symptoms of compression. Generally this becomes apparent at once, but has been known to appear rather late, as late as two weeks after treatment. In the case of the above tumor, situated as it was, such an aggravation would be very dangerous. Hence, we emphasize the necessity of a neurological diagnosis.

We have not applied the extreme doses prescribed by Nordentoft, at least not at first, as we wished to be absolutely certain that the dosage would be harmless to the patient. We have employed smaller doses, increasing them if we felt it was necessary.

Some of our patients after an apparent cure have had signs of a recurrence later. This happened in three cases of what were probably gliomas.

The authors are inclined to the opinion that instead of waiting until recurrence is clinically apparent that it is a better plan to give treatments systematically throughout a period of say three months in the case of any tumor suspected of being a glioma, and this should be done, they believe, even though the patient seems to be entirely well.

Radiation does not exclude surgery. All the cases here reported were poor surgical risks. Surgery remains the last resource always and it should never be too long delayed, but whenever radiotherapy would seem to be applicable the authors would give it a trial before resorting to surgery. In the inoperable cases radiotherapy offers hope instead of resigned contemplation.

Statistics and Technique in the Treatment of Superficial Malignancy With Radium, Roentgen Rays and Electrothermic Coagulation. J. Thompson Stevens, M. D., Am. J. Roentgenol. 11:241-246, March, 1924.

DETAILS of technique occupy almost the entire article. The author says that approximately one hundred per cent of skin malignancies, with the exception of melanotic sarcomata, can be cured if treated early and correctly with radiation therapy plus electrothermic coagulation.

The melanoma, which is the benign forerunner of melanotic sarcoma, when treated correctly with the same agents, should produce equally satisfactory results, but the treatment of melanotic sarcomata yields uniformly bad results.

Treatment of Laryngological Tuberculosis by Finsen Light Baths. Ove Strandberg, M. D., Finsen Light Institute, Copenhagen, Proc. Roy. Soc. Med. 17:25, February, 1924.

THE FINSEN bath, consisting mainly of an electric carbon arc light, is an effective cure for rhinolaryngological lupus vulgaris and tuberculosis of the larynx, even when used alone, but when combined with other forms of treatment, either surgical or electrocoagulative, results are more quickly secured.

Most of the cases herein reported were advanced cases, the patients coming from very poor homes and not able to afford special diet nor rest, nevertheless, 53 per cent were cured and nearly all were greatly benefited.

Two sizes of lamps were used, the smaller one, for cases confined to bed, consists of three electric carbon arc lamps connected in parallel (or

in a series when using a current of 220 volts with a series resistance of 55 volts). These three lamps are suspended from the ceiling and have check rods in a perpendicular plane to prevent rotary movement. Two patients, each on a separate couch, can be treated at one time. The couch must be as close to the light as is possible, the distance between the light arcs 550 mm., the lamps use 20 amperes and 55 volts each.

The larger lamps of 75 amperes and 55 volts are used for patients able to sit up for a period of time (few minutes to three-quarters of an hour). The distance between these arc lights is 600 mm., the carbon electrodes must be perpendicular to each other, the positive uppermost. If alternating current is used, it must first be changed to direct. No glass or other covering is to be used and the carbon electrodes must not be allowed to glow nor to become sooty. Patients' faces and eyes must be protected by paper shields, but the rest of the body should be entirely naked, the patients sitting as near the light as they can endure the heat and turning the body occasionally. For the larger lamps the room should have a capacity of 75 to 80 cubic meters and the floor should measure 5.5 by 5.3 meters.

Patients with tuberculosis of the larynx or who have been otherwise seriously ill begin with the small lamp, ten to fifteen minutes per day, for a few days and gradually the time is increased up to two and one-half hours every other day until they are well enough to sit up and be treated with the larger lamps. Patients whose general health is good begin with the larger lamps for from thirty to forty-five minutes per day. A tepid shower bath is taken after treatment and patients may then go home or go back to their place of work. There seems to be no tendency to take cold even in cold weather.

Certain heart and kidney troubles are a contra-indication to this form of treatment.

Radium in Cancer of the Larynx. WILLIAM S. NEWCOMET, M. D., Surg. Clin. N. A. 4:97-100, February, 1924.

THERE are no general rules for the application of radium to the larynx. All cases in which operation is not advisable should have radium. There are three distinct methods of using it in this lesion: (1) cross-fire of the neck; (2) application of the radium capsule to the inside of the larynx; (3) imbedding the active capsule directly in the diseased tissue. If the last two methods are employed, the active capsule may contain a radium salt or a small emanation seed, the seed is preferable. The disadvantage of the last two methods is the amount of trauma produced and the severe reaction following. The author believes the cross-fire method yields equally good results without the disagreeable features of the other two methods. The difficulty lies in the calculation of the proper areas upon the neck from which to radiate the disease without causing too active a dermatitis. The application should be a suberythema dose to the skin area and a calculated full dose at the focus of the disease.

When there is marked overgrowth of tissue, radium may be placed directly in the body of the mass, but large doses by any method are not justifiable about the larynx. In the small ulcerative type, the cross-fire method should be tried first. In postoperative or prophylactic application of radium, the dosage is decidedly less than for the active disease and the interval between applications must be lengthened and continued for about a year after operation or disappearance of disease—this to be governed by the character of the disease and the susceptibility of the patient. Dosage should produce a faint reddening of the larynx and one that will cause dryness of the throat as in more active treatment. The dose producing this effect usually lies between 1200 to 2408 millicurie hours at one application.

There should be frequent observation of the patient for years after the larynx appears to be normal.

Radio-Surgical Treatment of Cancer of the Larynx. DR. LEDOUX, Brussels. Le Cancer 1:100-107, March, 1924.

THE author believes that the present methods of radiotherapy of the larynx ought to be abandoned, since even the most skilled radiologist is scarcely able to avert the late reactions following upon radium treatment as practiced at present.

The author follows a method embracing surgical and radium treatment. He first performs a tracheotomy and follows this by removal of the lymphtic glands and an application of radium to the surface. This procedure is followed by placing radium needles in the tumor itself.

Detailed description of the entire technique of each procedure is given. Technique differs in the different types of tumor. The text is abundantly illustrated.

The Treatment of Malignant Growths About the Face. SANFORD WITHERS, M. D., JOHN RANSON, M. D., Colorado Med. 21:92-97, April, 1924.

THIS article discusses the histological characteristics which determine the susceptibility to radiation and the local conditions influencing the reaction to radiation.

The cellular reaction to radiation depends upon the amount of radiant energy absorbed, irrespective of whether it be primary or secondary in origin. Susceptibility to short wave-length therapy is a cellular characteristic depending upon a definite histological structure. The normal tissue reaction to radiation and neoplastic invasion depends to a large degree upon the well being of the body as a whole.

There is sufficient data to predicate on *a priori* grounds those tissues or tumors which will prove radioresistant or radiosusceptible. The use of radium or x-ray is just as radical and rational a procedure as the use of other physical agents in neoplasm, and this therapy requires an equal amount of surgical judgment and a more complete knowledge of the pathology present, also a broader biophysical training than the corresponding surgical treatment.

In cases where a cure is sought, not palliation alone, an attempt should be made to give the dose at a single sitting which will tend to obviate the necessity of a second or third dose of greater intensity with its consequent greater damage to normal tissues, which become less radioresistant while the malignant cells become more radioresistant.

Use of X-Ray and Radium in Superficial Malignancies. A. M. COLE, M. D., J. Indiana M. A. 17:71-76, March, 1924.

RADIATION therapy of superficial cancer is far superior to any other form of treatment. Caustics should never be used and the knife but rarely.

In advanced and widespread epitheliomas the "hypermassive" x-ray technique gives splendid results. Radium and electrocoagulation are useful adjuncts in some cases. Failure is usually due to an inadequate dosage. Fractional technique is only for very superficial lesions. Lip cancer should be treated by radium, followed by electrocoagulation with heavy doses of filtered x-ray to the glands.

No exact technique can be laid down, as conditions vary so greatly. The technique for one apparatus

would not be used for another. The nature of the lesion, its position, size, age, and the abscense or presence of glandular involvement are the most important factors to consider.

The author attributes his success to the "hypermassive" doses used after the method of Grier and Bowen. The x-ray has been the chief reliance, radium has been used at times, especially in the involvement of cavities. Electrocoagulation has been used in some cases.

X-Ray Treatment of Interstitial Keratitis. T. L. DeCourcy, M. D., J. H. Mather, M. B., Ch. B., D. M. R. E., Brit. J. Radiol. 29:105-109, March, 1924.

CONCLUSIONS by the authors: 1. In syphilitic keratitis (we have not treated by this method a case known to be definitely tuberculous) x-rays in weak doses have an undoubted effect in cutting short the early stages of infiltration into the deeper corneal layers.

2. The earlier the stage of the disease at which this treatment is started, the more rapid the improvement and the more satisfactory the results.

3. The younger the patient, the better the reaction to x-rays. In the cases treated, children reacted more rapidly than young adults, whilst in older people the reaction was less satisfactory.

4. It is in the relief of pain, photophobia and lacrymation that x-rays show the most striking results. The acute stage is also much shortened by checking, infiltration and vascularization.

5. The opacities in young subjects are undoubtedly benefited by x-rays. This was strikingly shown in a case reported in this article, but is opposed to the findings of the foreign writers.

6. In no case was any damage done to the eye or the surrounding tissues, and the patients complained of no inconvenience during the treatment.

7. Small doses only of x-rays are necessary.

8. X-rays should be used as an aid to, but should not take the place of, local anti-syphilitic and general treatment.

9. The value of small doses of x-rays shown in interstitial keratitis justifies their trial in certain chronic eye diseases where treatment has been disappointing, such as the painful blind glaucomatous eye and scleritis in the aged. Further, a safe and more stabilized technique such as that here described holds out hope of better results in many eye conditions, both chronic and acute.

The technique is described thus: Patient lying on back on couch, head firmly fixed by sandbags brought up level with the forehead on each side; using a rectangular piece of felt about 14 by 6 inches, to which two layers of lead foil have been stitched, two circular holes the size of the eyeballs and about that distance apart are cut and the pad is accurately centered, felt side down, over the eyes and held in position with sand bags. The tube stand with a lead glass speculum just large enough to include the eyes, is placed in position so that the distance between the anticathode and the eye is eight inches. A seven-inch gas tube is used, through which a current of 1 ma. backing up a six-inch spark gap is used, the rays being filtered through 0.5 mm. aluminum and one layer of felt. Time is six minutes and treatment is given every seven days; usually five or six treatments suffice.

Uses and Abuses of Radiology in Dental Practice. Jacques M. Strully, D. D. S., Internat. J. Orthodontia, Oral Surg. & Radiol., 10:172-177, March, 1924.

THE theory of oral foci of infection has often been abused by medical men and still is, to the great detriment of many a patient. The author does not so much blame the medical practitioner as he does the dental practitioner, for if the latter were able to correctly diagnose cases presented to him, he would not only refuse to carry out mistaken instructions, but would be able to give a sound reason for such a refusal.

No dentist should be using an x-ray machine unless he has fully mastered the art of radiography and the science of interpretation, nor should he ever send a patient to a commercial laboratory.

Some operators are under the erroneous impression that the x-rays show every abnormal condition, which of course is not the case. The rays reveal the following, says this author: complete and incomplete root canal fillings, caries in teeth, fractured roots, ill fitting crowns, overhanging fillings, alveolar absorption, pulp stones, necrotic and fractured bone, impacted and unerupted teeth, hypercementomas, hyperosteomas, foreign bodies, rarefactions, cysts and tumors. The rays do not show pus, inflamations, infections, vital or nonvital pulps, pericementitis or pulpitis.

Importance of the X-ray in Extracting. Agnew Irwin, D. D. S., Dental Cosmos, 76:328-329, March, 1924.

CASE histories are here given to prove that without the x-ray one does not know whether a normal sized root is present or whether absorption has taken place; whether the root is long or short, curved or straight, nor in what direction curved. Neither does one know whether the root is cone-shaped, cylindrical or club-shaped, whether there are extra roots or adjacent buried roots or adjacent diseased teeth.

Measurements of Two American and Two German Deep Therapy Machines by Means of the Duane Method and the Friedrich Iontoquantimeter. George E. Pfahler, M. D., and Bernard P. Widmann, M. D., Am. J. Roentgenol. 11:267-270, March, 1924.

THE authors' conclusions are these: "(1) In interpreting the dose values as used by one author or another, one must know not only the voltage, the milliamperage, the filter, and the distance, but also the type of machine used, if the direct method of measurements is employed, and we should be cautious in interpreting the value of an unknown machine. (2) The size of the field of irradiation influences, not only the depth dose, but also the surface dose. (3) If one of the direct methods of measurements is referred to, one should know its type and also its accuracy. Careful tests of the new instrument as it comes from the manufacturer should be made before depending upon it for clinical work."

Concerning the Photographic Measurement of Roentgen Rays and Its Applicability to Dosage. George Jaeckel, M. D. From the Women's Clinic of the University, Berlin.

THIS reprint has been received with a notation especially calling it to our attention in connection with Doctor Dessauer's article published in the December issue of the Journal.

Dessauer's method of measuring dosage is held to be faulty for the following reasons: (1) The thickness of a single film varies always, as is well known to photochemists. None can be depended upon to be of uniform thickness. (2) The film taken as a standard of measurement and the one tested against it must each be developed by exactly the same technique to be of any value. (3) The effect of scattered radiation

from the walls must also be taken into consideration. (4) Scattered and secondary radiations from the silver lead to errors of calculation in establishing the standard. (5) Due to chemical reasons, the intensities computed for the edge of the field are erroneous. The author states that in the interests of deep therapy some more accurate standard of measurement must be worked out.

Certain Recent Discoveries in Physics and Their Bearing Upon Cancer Therapy. DR. SLUYS, Brussels. Le Cancer, 1:128-144, March, 1924.

THE author discusses the electronic theory of the atom in relation to cancer therapy and he believes that the solution of the cancer problem very likely lies in the realm of physics. He advocates cooperation of physician, physiologist, biochemist and physicist in research upon this subject.

Some Effects and Uses of Medical Diathermy. A. J. PACINI, M. D., Service - Suggestions 24 : March-April, 1924.

THE principal effects of medical diathermy are to provoke changes in

I. *The nerves of sensibility*, which, through the warmth that diathermy imparts, are lessened in irritability with a consequent disappearance of *pains*

II. *The motor nerves and muscles.* Under the influence of the heat that diathermy produces, smooth and striped muscle loses abnormal spasticity and tension.

III. *The blood and lymph vessels*, which engorge and give rise to an active hyperemia, and the hyperemia, in turn, leads to

1. Relief from pain;
2. Bacterial growth inhibition;
3. Resorption;
4. Dissolution of chemical deposits;
5. Nutritive stimulation.

IV. *The chemically functioning parenchyma.* All chemically active cells are stimulated to greater chemical activity under the effect of temperature rise which diathermy furnishes.

Because of these definitely procurable responses to diathermy, many conditions whose pathologies are centered primarily upon changes in the physiological system enumerated, yield promptly and pleasantly to this agent.

For example:

I. Brachial, trigeminal and sciatic neuralgias; neuritis; migraine; and numerous additional sensory outbursts are quieted under diathermy.

II. Traumatic joints, sprains, strains, effusions, exudates, transudates, hydro-arthritic infiltrations and edematous accumulations anywhere are resorbed under the vascular activity precipitated by diathermy.

IV. The chemical inertia of white blood cells, unable to provide adequate defense against the invasion of the pneumococcus, is overcome by the "internal poultice" (diathermy) with much success in pneumonia.

Here are some of the conditions that call for medical diathermy:

Circulatory diseases: Angina pectoris; intermittent claudication; hypertension; internal hemorrhoids; frost bites.

Nervous system diseases: Neuralgia (brachial, sciatic, trigeminal); Parkinson's disease; migraine; hypothermias; Raynaud's syndrome; infantile paralysis; chronic anterior poliomyelitis.

Digestive tract diseases: Gastropathies; sub-acute and chronic appendicitis; peritoneal adhesions.

Muscular system diseases: Myalgias; lumbago; wry neck.

Jointss Articular rheumatism; gout; gonorrheal arthritis; traumatic arthritis; osteo-arthritis; hydroarthritis; sprains; strains.

Respiratory tract diseases: Pneumonia; bronchitis; pleurisy; first stage tuberculosis; the residual pathology following war-gassing.

Urogenital diseases: Dysmenorrhea; ovaritis; salpingitis; prostate enlargement and congestion.

Skin pathologies: Varicose ulcers; roentgen ray and radium burns; eczemas.

Proper tissue temperature is imperative for the correct functioning of a part. If pathology impairs the normal physiology of the structure, and in that fashion deranges the proper temperature, then diathermy, or "internal poulticing," is valuable. Nothing known to science can bring a fine, regulated, measured and timed quantity of heat to an internal structure as well as diathermy. It has no substitutes in this capacity. Its medical use is fraught with much good. Its indications are many.

For all of the conditions mentioned and for many other conditions, the detailed technique of Bordier, Nogier, Kowarschik, Bourttau, Mann, Krause, Levy-Dorn, Cabrera is available. Many of these leading physiotherapeutists are constantly improving the methods used in medical (and surgical) diathermy. One improvement is the use of the diathermic lubricant with the coaptation mesh electrode. The lubricant is a conductor of diathermic currents. It accepts the pliable metallic cloth that forms the electrode and holds it smoothly and securely in place throughout the treatment.

In a word, diathermy affords an "internal poultice," the medical uses for which are numerous and obvious.

The above is quoted verbatim from the author's article.